

# INSTITUTIONAL AND POLICY ANALYSIS OF RIVER BASIN MANAGEMENT

## *The Alto-Tietê River Basin, São Paulo, Brazil<sup>1</sup>*

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## 1. Background and Introduction

Brazil is a forerunner in adopting a new water resource management system in consonance with the principles recommended by major international charters and organizations such as the Dublin Statement of 1992 and the World Bank in 1993. These principles include the integration of sectoral policies, the decentralization of management to the river basin level, the participation of stakeholders, and the concept of water as an economic good. To date, 25 of Brazil's 26 states and the federal district have passed water laws. New water legislation was first approved in the state of São Paulo in 1991, followed by Ceará in 1992 and subsequently several other states. Eleven states passed water legislation before the National Law, and state-level "experiments" contributed substantially to the design of the federal framework<sup>2</sup>. The National Water Law, approved in 1997, embraced the main aspects of the new approach taken by the pioneering states and thus confirmed that Brazilian water management had entered a new era.

Making the river basin the basic unit in the system's organizational structure was largely based on the French system. Similar to that system, the concession and control of regulatory instruments such as water permits, controlling pollution sources, and issuing environmental permits remain under the responsibilities of public water management agencies. The Brazilian proposal was also similar to the French system in that two kinds of river basin institutions were to be created. Basin Committees would be the deliberative bodies where negotiations and participatory decision-making take place. Basin agencies would be the "executive arm" of the committees, providing technical support and implementing their decisions. The laws also created a new water management instrument: bulk water charges, which would give financial autonomy to the new basin institutions. Many states in the Northeast of Brazil diverged from this approach by adopting a management system that allocated more power to state-level institutions than to river basin organizations.

In general, reformers at the state and federal levels opted for a stage-by-stage process of regulation and implementation, generally starting with the creation of regulatory bodies (national and state councils, committees at the river basin or sub-basin level), which would then define the details of how the management instruments foreseen in the legislation (permits, charges, etc.) would operate. Many basin committees have been created in the country, mostly in the South and Southeast regions, almost all at the state level. However, reformers failed to approve crucial regulations, particularly those relating to bulk water charges. The reform is thus still underway, with great variations in its dynamics and advances at the federal, state and river basin level.

São Paulo state would have been a likely place to expect the strongest advances in promoting decentralized, stakeholder models of water resources management in Brazil. It was there —in the state that had the richest, best-equipped and most-experienced water management institutions — that the new conceptual framework coalesced and that the

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<sup>2</sup> The distinction of the 1988 Constitution between federal and state waters required separate institutional frameworks at both levels of government. The federal government has jurisdiction over waters that cross state or international boundaries. The water located entirely within the territory of a single state, as well groundwater resources, are in state domain, except when they are used by federal infrastructure projects.

first steps towards implementation took place, with no federal assistance. However, further implementation of the reform has proved challenging.

In the Alto-Tietê River Basin, the subject of this Working Paper, the advances and difficulties faced by the implementation of the São Paulo water reform are well illustrated, particularly because of the high levels of industrialization and urbanization of the basin. This case study is part of an international study of experiences in decentralizing integrated water management to the lowest appropriate level. The larger study, supported by the World Bank, seeks to evaluate the extent to which river basin management efforts have been successful and to identify the factors that can be associated with both positive and negative outcomes. An important consideration in this context is that “the lowest appropriate level” for integrated river basin management varies between countries, states and even river basins. For this reason, the methodology necessarily needs to take into account the hydrological, socio-economic, cultural and historical conditions in the case study areas. The present research project explores these factors both through a survey of river basin organizations throughout the world and case studies of eight river basins, namely the Murray Darling River basin in Australia, the Fraser basin in Canada, the Tárcoles basin in Costa Rica, the Brantas basin in Indonesia, the Warta basin of Poland, the Guadalquivir basin in Spain, and the Alto Tietê and Jaguaribe basins in Brazil.

In the next two sections, the analytical framework and methodology of the study are presented. The paper then briefly describes the Alto-Tietê basin, the new institutional arrangements there, and the role of stakeholders in these institutions. It then further examines these changes through the lens of the analytical framework presented by looking at how a series of factors affect the evolution of decentralization, such as initial conditions and context, the level of commitment to decentralization on the part of both central and local authorities, the capacities of central and local institutions, and the design of basin-level institutions. Finally, the paper assesses the performance of the decentralization process by examining three critical factors: devolution of authority, stakeholder participation and financial self-sustainability.

## **2. Analytical Framework**

This case study follows the analytical framework established by the research team and applied in all eight case studies. The literature on institutional analysis of natural resource management and decentralization identifies a series of political and institutional factors associated with the emergence and sustainability of stakeholder-based, decentralized arrangements (Ostrom 1990, 1992; Agrawal 2000; Alaerts 1999; Blomquist and Schlager 1999; Bromley 1999; Easter and Hearne 1993; and Wunsch 1991). The studies seek to evaluate how these factors operate in each of the empirical settings considered.

The framework explores a series of political and institutional variables.

i) Contextual factors and initial conditions. The literature on decentralized water resource management suggests that successful decentralization is at least partly associated with the social context at the time a decentralization initiative is attempted, including:

- Economic development of the nation;
- Economic development of the basin area;

- Initial distribution of resources among basin stakeholders; and
- Class, religious, or other social/cultural distinctions among basin stakeholders.

ii) Characteristics of the decentralization process. In countries that have attempted to decentralize water resource management to the basin level, characteristics of the decentralization process itself will affect the prospects for successful implementation. Two necessary conditions of a decentralization initiative are (a) devolution of authority and responsibility from the center, and (b) acceptance of that authority and responsibility by local or regional units. Whether (a) and (b) occur will depend in part upon why and how the decentralization takes place. Important factors include

- Whether basin-level management was a local initiative, a devolution that was mutually desired by local stakeholders and central government officials, or a decision by central government officials to release themselves of responsibilities regardless of whether basin stakeholders wanted to assume them;
- The extent of central-government recognition of local-level basin governance; and,
- Whether commitment to decentralization and basin management is maintained after transitions in central government administration.

iii) Characteristics of central government/basin-level relationships and capacities. Because successful decentralization requires complementary actions at the central government and local levels, other aspects of the central-local relationship can be expected to affect that success. Political and institutional variables should be explored that relate to the respective capacities of the central government and the basin-level stakeholders, and the relationship between them. Key factors include

- The extent to which devolution of water management responsibilities from central government to basin institutions has been real or merely rhetorical, and whether devolution has been handled as a supportive transition to basin management or as an abrupt abandonment of central government authority;
- The financial resources available to basin-level institutions, and the extent of their financial autonomy;
- The ability of basin management participants to create and modify institutional arrangements according to their needs and circumstances;
- The existence of other experiences with local self-governance and service provision in the country;
- The distribution of national-level political influence among basin stakeholders;
- The extent to which the country's water rights system facilitates or hinders basin management efforts; and
- Whether basin-level institutions have had adequate time for implementation and adaptation of basin management activities.

iv) The internal configuration of basin-level institutional arrangements. Successful implementation of decentralized water resource management will also depend on features of the basin-level arrangements. Important aspects include

- The presence of basin-level governance institutions;
- The extent to which there is clarity about institutional boundaries, and whether these match with basin boundaries;
- Whether and to what extent basin-level institutional arrangements recognize sub-basin communities of interest;
- The availability of fora for information-sharing and communication among basin stakeholders;
- The ability to make, monitor, and enforce contingent contracts through which basin stakeholders can contribute to improvements in basin conditions;
- The institutionalization of basin monitoring systems that have credibility among water users; and
- The availability of fora for conflict resolution.

Since some factors will have stronger impacts than others in each case, the goal of the research is not to describe in detail how each of these factors operate in every case. Instead, we seek to identify which factors are more powerful indicators of outcomes in each setting and how under different conditions, these factors combine in unique ways.

### **3. Methodology**

Following the approach defined for all case studies in the larger project, research for this paper involved the examination of primary documents on the basin and on the organizations involved and of a background paper prepared prior to fieldwork<sup>3</sup>. After this preliminary work, interviews were conducted with stakeholders. Since participants and observers are likely to have different assessments of the variables under consideration, people with diverse perspectives and positions were interviewed.

Two field visits were carried out, during which team members met with and interviewed a range of individuals, including past and current federal and state government officials, current officials in water institutions, and members of basin committees from all sectors (water users, municipalities, and organizations of civil society). The interviews sought to understand how decentralization efforts have affected current institutional arrangements for water management at the sub-basin, basin and state levels and to evaluate the performance of these arrangements.

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<sup>3</sup> The background paper for the Brazilian cases —Jaguaribe and Alto-Tietê River Basins —, was prepared by Rosa Maria Formiga Johnsson and is available at [www.worldbank.org/riverbasinmanagement](http://www.worldbank.org/riverbasinmanagement)

#### 4. The Alto-Tietê River Basin

Brazil has always been considered a country rich in water. It is estimated that about 12% of the world's surface water resources are located in the country.<sup>4</sup> Per capita water availability reaches 40,000 m<sup>3</sup>/inhab/year. But this impressive number masks an extremely uneven distribution of water resources among regions.

The Amazon river basin alone, which covers 48% of the country's territory, accounts for 75% of Brazil's freshwater resources but houses only 4% of its population. The most dramatic departure from abundance can be found in the Northeast region, which includes most of the semi-arid region of the country. Accounting for 18% of Brazil's territory and about 28% of its population, this region has only 5% of the country's water resources and is subject to recurrent, severe droughts, harvest failures and food shortages. With 73% of the country's population, 11% of its territory, and about 10% of its water resources, the Southeast is the heart of Brazil's industrial economy and also has the highest agricultural production. This growth has generated increasing pressure on the region's water resources, due to conflicting demands from multiple users and the steady deterioration of water quality. The current case study is particularly illustrative of the problems faced by water management in highly urbanized and industrialized humid regions in Brazil.

The Tietê —São Paulo state's largest river— runs 1,100 Km from its eastern source in the São Paulo Metropolitan Region to the western border of the state where it joins the Paraná river, which then runs southward, toward the Rio de la Plata estuary between Argentina and Uruguay (Figure 1).

The Alto-Tietê corresponds to the upper part of the basin, from the headwaters of the Tietê River in Salesópolis city to the Rasgão Reservoir<sup>5</sup>. Most of the Alto Tietê's urban area lies on sedimentary soils. The climate in the basin is typical of tropical high plain savannas, with a temperate summer. The average temperature in the basin is about 17.8 degrees Celsius, and ranges from annual averages of 13.8 to 24.3 degrees Celsius. Precipitation varies little throughout the basin, averaging at 1,400 mm per year.

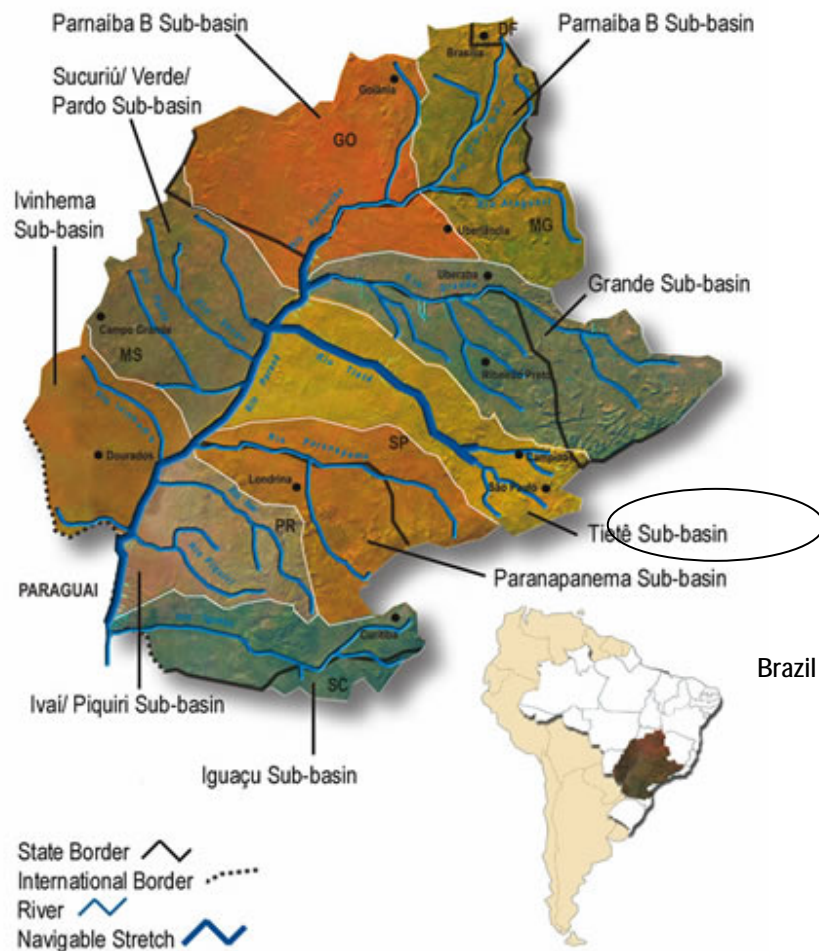
The area covered by the Alto Tietê basin is almost coterminous with the Metropolitan Region of São Paulo (RMSP). With a drainage area of 5,985 square kilometers (2.4% of the state's territory), the basin encompasses 35 of the 39 municipalities and 99.5% of the population of Greater São Paulo. 37% of the basin's territory is urbanized. Population growth and urban sprawl in Greater São Paulo have been rapid and uncontrolled in recent decades. Currently, despite the tendency toward stabilized population growth in Greater São Paulo, urban sprawl continues to expand as low-income residents are continually expelled from the urban center to the city's periphery. In 2000, 17.8 million people lived in the basin and estimates are that in 2010, the population will reach 20 million (FUSP, 2002a).

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<sup>4</sup> Surface water availability is 182,600 m<sup>3</sup>/s, which reaches 272,000 m<sup>3</sup>/s if one considers the flow from neighboring countries into the Amazon river basin. The total volume of groundwater resources is estimated at 112 billion m<sup>3</sup>. All data presented in this section are from ANA, 2002.

<sup>5</sup> This document refers to this hydrographic unit as the Alto Tietê "basin", as it is normally called.





**Figure 1: Tietê River Basin in the Paraná Hydrographic Region**

Source: Ana, 2002b.

This massive human occupation was accompanied by the large-scale construction of water infrastructure, including dams, pumping stations, canals, tunnels and inter-basin transfers to and from neighboring basins. These projects were usually built to serve multiple purposes, especially hydropower, urban supply, and flood control. Today, the Alto-Tietê basin is served by a complex hydraulic and hydrological system, as shown in Figure 2. Despite this extensive water infrastructure, the water availability of the region is still very low ( $201 \text{ m}^3/\text{hab}/\text{an}$ ), even lower than the semi-arid regions of the Brazilian Northeast.

Greater São Paulo is the most important industrial producer of the country. São Paulo City is South America's financial center and is the world's second largest city, accounting for 18% of the national GDP and 20% of Brazil's industrial production. The industrial sector is important both in terms of employment and income. Services have also grown, becoming in recent years the most important sector for generating employment in the region.



group of systems are estimated to increase availability to 73 m<sup>3</sup>/s in 2010<sup>6</sup>. At this time, urban demand is estimated at between 69.8 and 78.6 m<sup>3</sup>/s. Other solutions will be needed in the middle to long run, such as water demand management, reuse, and expanding existing system capacity, or constructing new systems, most likely through importing water from adjacent basins.

**Uncontrolled use of groundwater resources.** Although the users in the Alto-Tietê basin are almost exclusively supplied by surface water, aquifers are an important supply alternative under scarcity conditions. Recently, a significant and worrisome increase in groundwater abstraction has been observed. A 2000 study estimated groundwater extraction in the basin at 7.9 m<sup>3</sup>/s, and expected it to increase to 10.9 m<sup>3</sup>/s by 2004, and to 16.5 m<sup>3</sup>/s by 2010. Industries are the largest consumer group in terms of number of wells (35%), followed by private homes and apartment buildings (25%) and services (24%) (FUSP, 2002b).

This increase is partly a result of SABESP's price policy and partly because of the lack of monitoring and control of groundwater use (FUSP, 2002b). In the municipalities not served by SABESP, where water and sanitation is provided by local government, groundwater extraction has also increased substantially. According to interviewees, this can be attributed to municipal governments' general lack of capacity in managing and expanding urban services. In general, the exploitation of groundwater resources has been systematically precarious and uncontrolled. The consequence is the lowering of the water table and a resulting increase in pumping costs, as well as the possibility of well contamination, potentially expanding to the most protected zones of the aquifer (Hirata *et al.*, 2002)<sup>7</sup>.

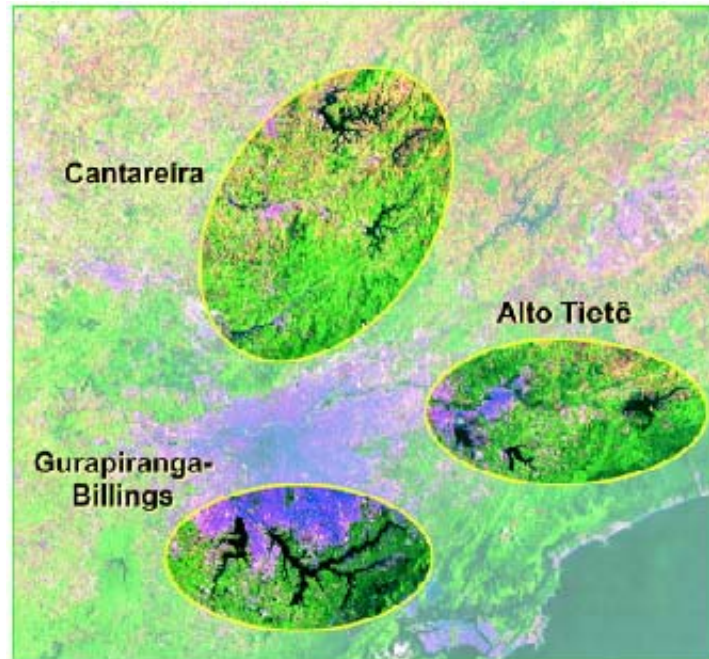
**Water resources protection and urban expansion.** Water supply for various uses is highly dependent on the Alto Tietê's public water supply systems, mostly operated by the state water sanitation company (SABESP-*Companhia de Água e Esgoto do Estado de São Paulo*). However, population growth in the metropolitan area is moving precisely towards the main sources of drinking water. The causes are related to the lack of housing policy and high income concentration, both of which have fostered the growth of an informal housing market. This informal market is difficult to regulate through the command-and-control land use policies currently in place. Ultimately, areas that are more tightly regulated (but where enforcement only involves the emission of licenses and permits necessary to carry out a formal activity) are most subject to the expansion of informal land uses, since formal activities are not permitted in those areas.

Figure 3 shows the location of the three most important water source systems (Cantareira, Guarapiranga-Billings, and Alto-Tietê) as well as the urbanized area of the region, showing how the city is advancing into water source protection areas.

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<sup>6</sup> The Alto-Tietê Basin Plan indicated that the planned infrastructure projects for the basin would increase availability to 66.2 m<sup>3</sup>/s in 2004 (FUSP, 2002a).

<sup>7</sup> The problems related to the exploitation of groundwater resources in the Alto-Tietê basin are extensively analyzed in Hirata, Ferrari, Ferreira *et al.* (2002).



**Figure 3: Urban expansion towards the major urban water supply systems of Greater São Paulo**

Source: FUSP, 2002b.

This expansion has occurred around the Guarapiranga and Billings reservoirs for several decades and, more recently, around the reservoirs of the Alto-Tietê System. Various attempts to regulate urban expansion to protect water sources have been unsuccessful. The state headwater protection law, passed in the 1970s, prohibited residential occupation in 53% of the metropolitan area, in order to protect strategic sources for urban supply (State Laws 898/75 and 1.172/76). However, because the law was not enforced effectively, it had perverse effects (Kemper, 1998). Since the informal economy could circumvent the law, the forms of expansion that were the hardest to monitor and regulate were the first to move into the areas. For example, in the Guarapiranga basin only industries were, in practice, impeded from locating in the protected area because they would not be able to obtain commercial and industrial permits. Meanwhile, the informal housing market (that is, housing for the poor) faced fewer impediments. Uncontrolled and disorderly residential expansion thus occurred in the Guarapiranga basin, with new areas appearing without adequate water and sewerage services — precisely in areas where water source protection was most important.

In recognition of the perverse effects of an approach that focused only on policing measures, the Headwaters Law was revised in 1997 (State Law 9.866/97) to allow controlled land use and water management in the municipalities, permitting controlled industrialization, tourism facilities, installation of sewerage systems and housing improvements. However, complementary regulations necessary to make the law operational have yet to come into effect. The impacts of the law on the rate of water source degradation has, thus, yet to be felt, raising major doubts about the conceptual foundations of this law, as pointed out by interviewees.

**Hydropower, growing urban demand and pollution.** The struggle for drinking water in Greater São Paulo also came into conflict with the influential hydropower sector<sup>8</sup>. The Guarapiranga and Billings reservoirs were built for power generation purposes in the 1920s and 1930s, respectively. For decades, the Alto-Tietê - Cubatão Complex diverted a large volume of water from the Tietê and Pinheiro rivers into the Billings reservoir (with a capacity of 1 billion m<sup>3</sup>) for use by the Henry Borden hydropower plant, located in the state's coastal area, in another hydrographic basin (see Figure 2 above). As had occurred in the late 1940s with the Guarapiranga reservoir, in the 1970s, the water in the Billings reservoir began to be needed to supply Greater São Paulo. But sanitation infrastructure in São Paulo failed to expand at the same rate as the population, resulting in severe pollution of these rivers and, consequently, of the Billings reservoir.

Even though engineers and politicians have for decades recognized the precariousness of both drinking water supply systems the priority for this complex was always given to hydropower generation (Rocha, 2002; Keck, 2002; Alvim, 2003). Pressures from environmental groups increased, however, and the state constitution of 1989 determined that the priority for use of the Billings Reservoir would be urban supply. Since 1992, the pumping to Billings has been suspended altogether, except when required for severe flood control. However, tensions continue since plans to increase energy production by pumping water from the Tietê and Pinheiros Rivers have remained on the agenda of the electricity company (EMAE-*Empresa Metropolitana de Água e Energia*)<sup>9</sup>. Today, the main function of the Guarapiranga reservoir is to supply São Paulo city. One isolated part of the Billings reservoir supplies some municipalities of Greater São Paulo, including São Paulo city.

**Lack of sewage collection and treatment.** Investments in treatment and collection network expansion were initiated in the Alto-Tietê basin in the 1970s and increased substantially in the 1990s. However, the situation still remains characterized by deficits in coverage and in substantial increases in water quality: only 65% of wastewater is collected and of that portion, only 32% is treated (FUSP, 2002b). Several major municipalities have their own sanitation systems, and these are particularly underserved since SABESP is the only water company in the basin that treats sewage.

SABESP's most recent estimates indicate a substantial increase in sewage collection, reducing the deficit in coverage from 17% in 2005 to 7% in 2020. There are, however, no estimates for increases in wastewater treatment (FUSP, 2002b).

**Improper solid waste collection and disposal.** Greater São Paulo has reasonable rates of collection and disposal of domestic solid waste, but the amount that is not collected or that is disposed of inadequately is still significant in absolute terms (IBGE, 2001): more than 700 metric tons of trash collected daily does not receive proper disposal and a large

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<sup>8</sup> Keck (2002) gives a global overview of the problem of water supply in the São Paulo metropolitan region from a historical and political perspective.

<sup>9</sup> After a major drought in 2000 which culminated in a national level energy crisis the following year, a special license was granted to transfer an outflow of up to 4 m<sup>3</sup>/s in the case of a demand for emergency power (FUSP, 2002b). There are also projects for cleaning up the Pinheiros river so that it would be possible to use it as was done in the past, but now attending the environmental regulations (Agência de Bacia do Alto-Tietê, 2004).



amount of garbage goes uncollected and is often disposed of in the region's rivers and lakes (FUSP, 2002b).

The situation for industrial solid waste is worse. Environmental problems have accumulated over the last few decades in water source protection areas, a result of industrial occupation that is either irregular or which occurred before the water source protection legislation came into effect or before the adoption of legal parameters to control soil and water pollution by industrial effluents.

In a recent study of Greater São Paulo's 39 municipalities, only 9 declared that they regulate the disposal of industrial waste, while 26 declared that they do not and 4 municipalities did not respond (FUSP, 2001).

**Water quality.** According to the water quality information produced by the state environment agency (CETESB), the principal rivers, including the Tietê, present reasonable water quality conditions in the upstream portion of the basin, with adequate levels of dissolved oxygen. However, in the downstream portion, from the border of São Paulo municipality onwards, these rivers are classified as of extremely low quality (FUSP, 2002a and 2002b).

The quality of the Guarapiranga reservoir continues to worsen, even with the launching of the pollution control program (Guarapiranga Project) in 1992, conducted in partnership with the World Bank. The Billings Reservoir has shown "good" to "excellent" ratings in terms of organic pollution since 1992, when the transfer of the heavily polluted water from the Pinheiros River by the electricity company was restricted. However, there are still concerns about eutrophization and about the presence of some heavy metals, such as lead. In the Alto-Tietê System, the reservoirs have good water quality conditions, but in the upstream part of the basin some have begun to show an increase in phosphorus and heavy metal ratings.

**Urban Flooding.** Land use in the São Paulo metropolitan region has followed a pattern of densification and verticalization resulting in increased impermeability of soils. The result has been that urban areas are both the causes of increased flooding and its main victims. The Alto-Tietê Water Resources Plan located 72 critical points during the floods of 1998-1999. Other critical sites are spread through the region, along the Tietê River itself as well as along its tributaries. Urbanization has led to the impermeability of 37% of land within the basin, further aggravating the situation. Like water source protection, this is a problem whose control depends on land-use planning. This is, however, a municipal responsibility, outside the control of water resources policy (a state attribution). Since 1998, a Macro-Drainage Plan for the Alto-Tietê basin—seeking to diagnose existing and expected problems and to devise solutions from a technical, economic, and environmental perspective—has been under preparation.

**Growing urban demand and inter-basin transfers.** So-called "relative water scarcity" (when water is abundant in quantity but inadequate in quality) led the Alto-Tietê basin to import water from neighboring basins in the 1970s. The water diverted from the Piracicaba and Capivari basins to the Guarapiranga System is currently responsible for half of the total water supplied in Greater São Paulo. However, a major conflict has emerged over recent years because the Piracicaba basin has undergone rapid population and economic growth, increasing significantly its own demand for water as well as the

level of pollution of its rivers. After an intense and lengthy mobilization that started in the 1980s, the Piracicaba basin only recently succeeded in getting more flexible operating rules for the Cantareira system adopted. These rules ensure minimum water quality conditions in the Piracicaba basin. This conflict and the movement that emerged around it also had great influence on the state water reform that occurred during the 1990s<sup>10</sup>.

The Cantareira conflict is emblematic of those likely to occur in the future with neighboring basins that are potential water providers for Greater São Paulo. These possibilities are extensively discussed in the Alto-Tietê Basin Plan (FUSP, 2002a and 2002b) which calls for an aggressive “demand management” approach, in order to postpone as long as possible the need to divert water from new sources.

## **6. Institutional Arrangements for Basin Management**

Contrary to the semi-arid region which has had a long history of federal intervention, water management practices in São Paulo State have historically been a local affair, even for the federal waters crossing it. This is especially the case of the Alto-Tietê Basin where all waters are under state dominion.

### **6.1 Prior To Decentralization**

The marked superiority of São Paulo’s institutional resources for water use and pollution management and control distinguishes it from other states in Brazil. In technical, human, and financial terms, São Paulo’s water management and environmental agencies are the best equipped in the country. The water resources management agency (*Departamento de Água e Energia Elétrica*, DAEE) was created in the 1950s and was the first to issue water use permits in Brazil. Nevertheless, it was unable to prevent or reduce the proliferation of policies affecting water use by other sectoral agencies, with little coordination.

The São Paulo State Environment Agency (*Companhia de Tecnologia de Saneamento Ambiental*, CETESB) was one of the first environmental protection agencies created in Brazil. It was created in the 1970s and has become widely respected in Brazil and abroad for its technical competence. Although responsible for all kinds of pollution control, CETESB’s command-and-control regulations have been mostly limited to the state’s largest industries and worst polluters. As a result, some other players, for example, water and sanitation companies, have been subject to much weaker regulation and enforcement. CETESB also lacks instruments, parameters, and procedures related to controlling diffuse sources of pollution, which are particularly important in the Greater São Paulo area because of the irregular and environmentally destructive character of urbanization.

Thus, despite having better financial and human resources than other agencies in Brazil, the São Paulo state management agencies were still unable to control, or even to keep up with, the speed and intensity with which water resources in the Alto-Tietê basin were being appropriated and used. In addition, there has been little coordination and integration between DAEE and CETESB to manage water quantity and quality, and between those agencies and many others directly involved with problems of water use

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<sup>10</sup> An extensive analysis of the mobilization of the Piracicaba River basin and its innovative role in the water reform process in São Paulo state can be found in Formiga-Johnsson (1998).

and planning in Greater São Paulo such as the State Agency for Metropolitan Development and Planning (*Empresa Paulista de Desenvolvimento Metropolitano*, EMPLASA). The co-existence of two water management agencies —DAEE (quantity) and CETESB (quality)— which are supposed to act in coordination, raises operational and political difficulties.

As in most Brazilian river basins, in the Alto-Tietê basin, prior to the reform, the system could be largely characterized as: (i) compartmentalized (quantity separate from quality, surface separate from groundwater resources); (ii) centralized finances, planning and decision-making at the state level, since the municipalities, private users, and civil society had no say in how to manage the water resources; and (iii) inadequate, considering the insufficient technical, administrative, and financial resources available for planning, control, and enforcement activities when compared to the complexity and magnitude of the problems.

## **6.2. The new approach to water resources management**

The proposal for creating a new state system for water resource management, which ultimately resulted in Law 7.663 of 1991, began to be studied and discussed in the 1980s. The debates were led by an elite group of *técnicos* (technical government officials) working at DAEE and involved all the state institutions related to water policy. São Paulo was the first in the country to define and adopt a new approach to water resources management, later adopted in several state laws and in the federal water law in 1997 (Table 1).

As in the French water resources management system<sup>11</sup>, the center of gravity of the new Brazilian one would be the river basin committees. These have a tripartite structure, with members representing the state government, municipalities and civil society. The committees were expected to initiate a new approach in planning and management, with the technical and administrative support of basin agencies. The key to this new approach would be the implementation of bulk water use charges for waters under state dominion. The allocation of revenues would follow investment plans approved by the committees and operationalized by the agencies<sup>12</sup>, thus guaranteeing the financial sustainability of the new basin institutions. A state fund to finance water management was also established (FEHIDRO). This entire management structure is supervised and regulated by the State Water Resources Council (CRH). Although legally, DAEE exercises the role of the basin agencies until the latter are created, both CETESB and DAEE continue to carry out their traditional functions as before the legislation.

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<sup>11</sup> In the French system, the basin committees are deliberative institutions where negotiations and participatory decision-making take place. The basin agencies are the committees' executive arm, providing technical support and implementing their decisions. The basin agencies collect bulk water charges and allocate the proceeds following committee intervention plans produced by the committees. The agencies have no policing and control powers nor can they own the public works financed by them.

<sup>12</sup> In the São Paulo system, a basin agency can serve more than one committee.



**Table 1: Main elements of São Paulo State Water Law 7.633/1991 and complementary legislation**

<p><b>Objective of the State Water Resources Policy:</b></p> <ul style="list-style-type: none"> <li>• Reliability of water availability for current and future generations, at the desired level of water quality</li> </ul>
<p><b>Principles:</b></p> <ul style="list-style-type: none"> <li>• Integrated water management, with the river basin as the planning unit</li> <li>• Water as a finite and fragile resource</li> <li>• Water as an economic good</li> <li>• Decentralized and participatory management</li> </ul>
<p><b>Organizations:</b></p> <ul style="list-style-type: none"> <li>• State Water Resource Council (CRH): deliberative body, with stakeholder participation, in charge of supervising and regulating the State Water Resources Management System</li> <li>• CORHI: CRH's Executive secretariat; technical body in charge of elaborating the state water resources plan and promoting institutional integration among all the state water related institutions.</li> <li>• State Water Management Agencies: in charge of water use and pollution control and in implementing the Water Resources Management System</li> <li>• FEHIDRO: São Paulo's Water Management Fund, supervised by an Advisory Council (COFEHIDRO), to be used mostly for projects and activities approved by the basin committees.</li> <li>• River Basin Committees: deliberative stakeholder bodies with decision-making and regulatory powers</li> <li>• River Basin Agencies: their technical and administrative arms</li> </ul>
<p><b>Instruments:</b></p> <ul style="list-style-type: none"> <li>• Basin water resources plans / State water resources plan(*)</li> <li>• Bulk water use permits</li> <li>• Bulk water charges(*)</li> <li>• Classification of water bodies according to predominant use and water quality standards</li> <li>• State water resource information system(*)</li> </ul>

(\*) These instruments were first introduced by the State Law. The remaining tools already existed, but either were not functioning as planned or their structure and functioning was modified significantly by the Law.

### **6.3. Implementing the State water law in the Alto-Tietê Basin.**

The 1991 water law called for the immediate creation of two basin committees, in the Alto-Tietê and Piracicaba-Capivara-Jundiaí hydrographic regions<sup>13</sup>. The Alto Tietê committee, however, was only formally established in November 1994, a result of a deliberate effort by the state *técnicos* (technical staff) to mobilize municipal government and, especially, civil society.

<sup>13</sup> Interestingly, what is referred to as the Alto Tietê "basin" does not actually correspond to an entire basin. The state water *técnicos* that designed the regions understood that management units based only on hydrological factors would be inappropriate for the new model. In 1994, they defined twenty-two management units that mix both hydrographical and socio-economic criteria. The result is that there is much interdependence among basins, including the Alto-Tietê which corresponds to the upper part of the Tietê river basin. The territorial scales in water management in Brazil are discussed at length in Formiga-Johnsson, 2004.

The formal functions of the committee were initially to be the same for those of other committees in São Paulo and elsewhere in Brazil. These included setting guidelines and approving river basin plans; proposing pricing criteria and values for bulk water pricing and a program for allocating proceeds derived from such water charges; integrating the decision-making and programs of water-related institutions working in the basin; and other responsibilities.

Committee governance is divided into four bodies: the Executive Board, the Assembly, the Executive Secretariat, and the Technical Chambers. The 48 seats of the committee assembly are divided equally among representatives of three sectors: municipal government, state government agencies (including public water users), and organized civil society groups (including those representing private water users). This composition is quite different from the later 1997 federal law, in which users are grouped together and must occupy exactly 40% of the seats and civil society at least 20%. For this reason, many have called the São Paulo model overly state-based.

After 1997, the Committee expanded, creating five subcommittees<sup>14</sup>. Even in the early stages of mobilization, the state *técnicos* involved in the creation of the Alto-Tietê basin committee recognized that the first State Plan, which divided the state into 22 management units, was not decentralized enough to deal with the complexity of such an intensely urbanized and industrialized region (Rocha, 2002). The creation of the subcommittees also addressed the need to minimize the dilemmas of legitimacy and representation, which were not well resolved at the metropolitan scale of the Alto Tietê Committee. Based on the perception of local identities and the conciliation of various conceptions, they proposed a division of the Alto-Tietê basin into five hydrologically-based sub-regions, which do not correspond to a purely hydrological sub-basin (Table 2 and Figure 4).

This division was designed in 1993-1994, but was only implemented in 1997 in the context of the revision of the Headwaters Protection Law. The new law called for the elaboration of specific legislation for each sub-basin of the Alto-Tietê. For this reason, although they also have the same attributions of the central committee, the main responsibilities of the subcommittees are the regulation and implementation of headwater conservation, protection, and recuperation policy at the local/regional levels. The number of seats varies by subcommittee (from 21 to 39 members), but all have the same tripartite composition as the main committee.

Local issues are thus decided in the sub-committees, although their deliberations must be submitted for approval to the Alto-Tietê Committee assembly. That body, in turn, is mainly responsible for promoting the integration of the sub-basin policies and to discuss basin-wide issues.

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<sup>14</sup> Cotia-Guarapiranga (1997), Juqueri-Cantareira (1997), Billings-Tamanduateí (1997), Pinheiros-Pirapora (1998), and Tietê Cabeceira (1998).

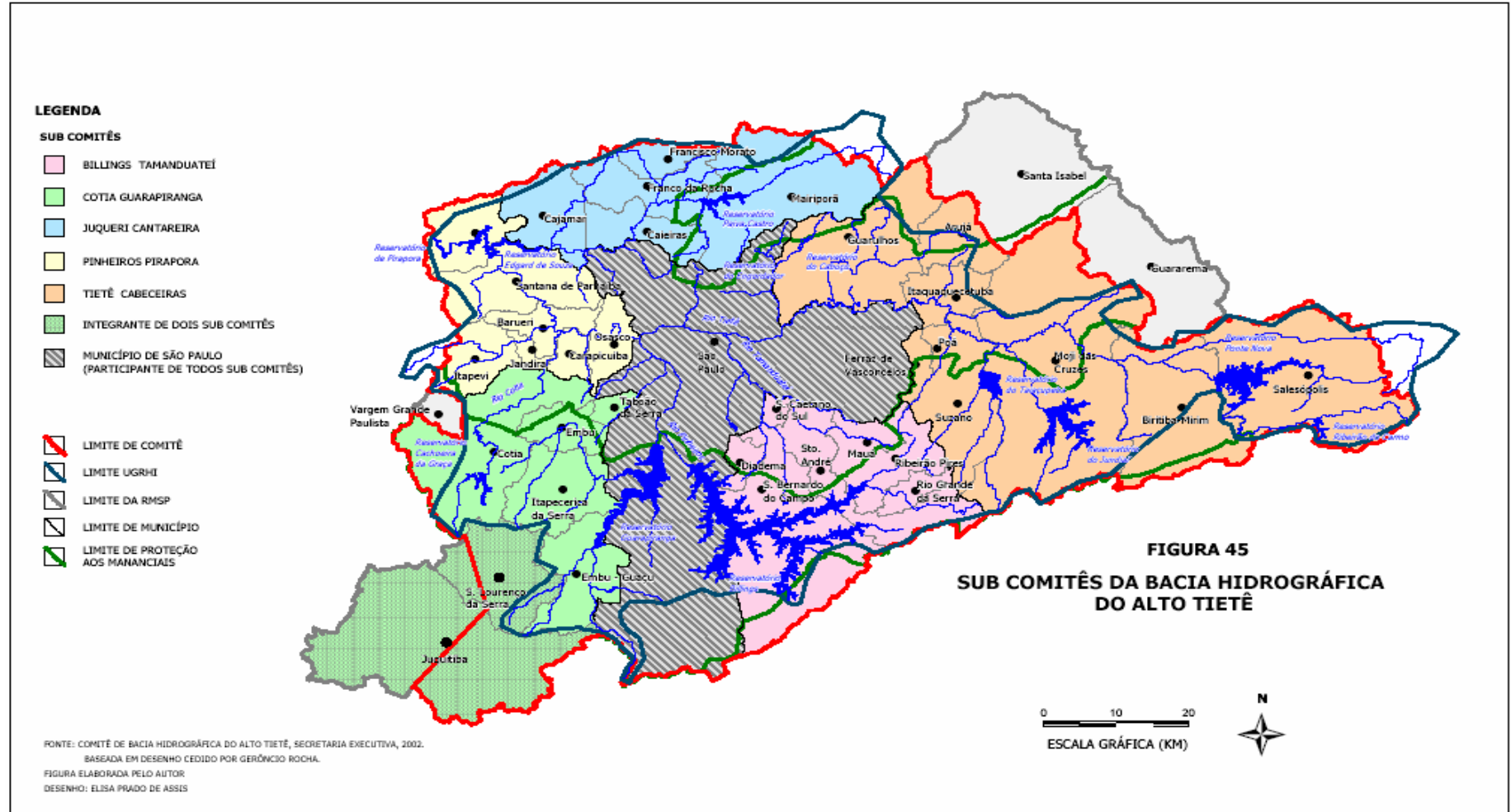
**Table 2: The Territorial Scales for Water Resources Management in São Paulo State and in the Alto-Tietê basin**

Hydrographic region	Hydrographic basin	Hydrographic unit for management purposes
PARANA RIVER BASIN (Part in São Paulo State: 212,197 km <sup>2</sup> )		Mantiqueira
		Sapucaí/Grande
	Pardo River Basin	Mogi Guaçu
		Pardo
		Baixo Pardo/Grande
	Tietê River Basin (77,474 km <sup>2</sup> )	Turvo/Grande
		São José dos dourados
		Alto Tietê (5,985 km <sup>2</sup> )
		Piracicaba/Capivari/Jundiaí
		Tietê/Sorocaba
		Tietê/Jacaré
		Tietê/Batalha
		Baixo Tietê
	Paranapanema Basin	Aguapei
		Peixe
		Alto Paranapanema
		Medio Paranapanema
		Pontal do Parapamema
	COASTAL BASINS	Paraíba do sul
		Litoral Norte
		Baixada Santista
		Ribeira Iguape e Litoral Sul

Juqueri-Cantareira (713 km <sup>2</sup> )	←	Alto Tietê (5,985 km <sup>2</sup> )
Tietê-Cabeceiras (1,694 km <sup>2</sup> )	←	Alto Tietê (5,985 km <sup>2</sup> )
Cotia-Guarapiranga (965 km <sup>2</sup> )	←	Alto Tietê (5,985 km <sup>2</sup> )
Billings-Tamanduatei (1,025 km <sup>2</sup> )	←	Alto Tietê (5,985 km <sup>2</sup> )
Pinheiros-Pirapora (1,588 km <sup>2</sup> )	←	Alto Tietê (5,985 km <sup>2</sup> )

Source: Formiga Johnsson, 1998, adapted.



**Figure 4: The Alto-Tietê Subcommittees**

Source: ALVIM, 2003.

Finally, it is important to note that the Alto-Tietê Committee created its basin agency in 2001, the only such agency created in São Paulo to date. However, this agency has only a small office and a three-person technical team. It is little more than a symbolic organization, while DAEE remains the committee's executive arm in charge of technical and administrative support (this issue is discussed more in Section 8).

In addition to these key institutions for water management in the Alto-Tietê Basin, many other agencies have influence over water issues, as indicated in Table 3.

**Table 3. Main institutions for water resources management in the Alto-Tietê River Basin**

Management level	Institution	Current water management attributions <i>Financial aspects</i>
<b>Federal government</b>  <i>Constitutional powers over water legislation, hydropower, and management and control of federal waters</i>	<b>ANA</b> <i>(Agência Nacional de Águas)</i>  National Water Agency	Establishment of the National Water Resources Policy and System. Priority for combating pollution and drought.  ANA (and others federal institutions) have little influence in the Alto-Tietê basin, except regarding hydropower issues and inter-basin transfers from federal rivers.  <i>Administrative and financial autonomy, funded by the federal budget and by royalties from the hydropower sector</i>
<b>State government</b>  <i>Constitutional powers over management and control of state waters</i>	<b>SERH</b> <i>(Secretaria de Energia, Recursos Hídricos e Saneamento)</i> Energy, Water Resources and Sanitation Secretariat	Establishment of State Water Resources Policy. Coordination of the state water management system, including DAEE and SABESP, which are subordinate to SERH.  <i>Funded through the state budget</i>
	<b>DAEE</b> <i>(Departamento de Águas e Energia Elétrica)</i>  State Water Resources Management Agency of São Paulo	Key institution for the implementation of the State Water Resources Policy and System. Priorities for water permit and control, water planning, and technical and administrative support to the basin committees. DAEE is also the main technical support for urban flooding control, drainage infrastructure and others water related projects of São Paulo municipalities. DAEE has 8 regional offices in the São Paulo State, in addition to its headquarters.  In the Alto-Tietê basin, it provides technical and administrative support to the main Committee and the sub-committees.  <i>Funded through the state budget.</i>
	<b>SMA</b> <i>(Secretaria de Meio Ambiente do Est. De São Paulo)</i> State Environment Secretariat	Among its many attributions, SMA is responsible for the establishment of State Environment Policy. Coordination of the state environment management system (SISEMA), including CETESB.  <i>Funded through the state budget</i>
	<b>CETESB</b> <i>(Companhia de Tecnologia de Saneamento Ambiental)</i> São Paulo State Environment Agency	Among many attributions related to environment, CETESB is responsible for issuing environmental permits and for monitoring and enforcing compliance of all kinds of pollution in São Paulo state. .  CETESB has 11 regional offices and 35 environment posts in the state.  <i>Funded through the state budget and environment multas.</i>

	<p><b>SABESP</b> (<i>Companhia de Água e Esgoto do estado de São Paulo</i>)</p> <p>State Water and Sanitation Company of São Paulo</p>	<p>As the largest water and sanitation company in South-America, SABESP serves 25 million consumers in 368 municipalities in São Paulo State, and operating 195 water treatment plants and 350 wastewater treatment plants</p> <p>In the Alto-Tietê basin, it provides urban water supply and sanitation services to São Paulo City and most municipalities of the basin. SABESP is the largest user in the basin.</p> <p><i>Funded through water fees and the state budget. Limited recovery of O&amp;M costs</i></p>
	<p><b>CRH</b> (<i>Conselho Estadual de Recursos Hídricos</i>)</p> <p>State Water Resources Council</p>	<p>Highest authority in São Paulo's Integrated Water Resources Management System.</p> <p>Deliberative body, with stakeholder participation (state, municipalities, civil society), in charge of supervising and regulating the State Water Resources Management System.</p> <p>The CRH relies on the technical expertise and administrative support of CORHI.</p>
	<p><b>CORHI</b> (<i>Comitê Coordenador do Plano Estadual de Recursos Hídricos</i>)</p> <p>São Paulo Coordinating Committee for the State Water Resources Plan</p>	<p>CORHI is the technical body of the system formed by DAEE (coordinator), CETESB, and the Secretariats of Water Resources and the Environment.</p> <p>Main attributions: Executive secretariat for the CRH; coordinates the revision of the state water resources plan every four years; promotes institutional integration among all the state water related institutions, including the establishment of technical working groups when necessary.</p>
	<p><b>FEHIDRO</b> (<i>Fundo Estadual de Recursos Hídricos</i>)</p> <p>São Paulo State Water Resources Fund</p>	<p>FEHIDRO is São Paulo's Water Management Fund, to be used mostly for projects and activities approved by the basin committees. It is supervised by an Advisory Council, COFEHIDRO, composed of 8 members of the CRH, observing parity between state and municipalities. BANESPA, a leading bank in São Paulo, is responsible for it's the fund's financial management. DAEE and CETESB are responsible for the technical viability and financial, economic and social-environmental analysis of the proposed projects.</p> <p>Since its establishment in 1994 until 2003, only royalties from the hydropower sector have been entering FEHIDRO, totaling about R\$208.6 million (US\$80.23 million). The main source of the fund is supposed to be bulk water charges.</p>
<b>River basin</b>	<p><b>Alto-Tietê Committee</b></p> <p><i>Formal institutions under state jurisdiction and regulation</i></p>	<p>Tri-partite composition: municipalities, state agencies (including public water users), and organized civil society groups (including those representing private water users).</p> <p>Main attributions include: integrating water related institutions and programs in the basin; approving river basin plans, proposing pricing criteria and values for water charging and a planning the application water charge proceeds, approving plans and programs related to the Headwater Protection Law of 1997, proposing of the (re)classification of water quality for sections of rivers in the basin, and others.</p> <p><i>Funded by FEHIDRO. Occasional financial support from its members.</i></p>

	<b>Sub-committees of Alto-Tietê Basin</b>  <i>Formal institutions submitted to the Alto-Tietê committee's regulation</i>	<p>Same tri-partite composition as the main committee.</p> <p>In addition to the main attributions of the main committee, the sub-committees are responsible for the regulation and implementation of headwater conservation, protection, and recuperation policy at the local/regional level.</p> <p><i>Funded by FEHIDRO. Occasional financial support from its members.</i></p>
	<b>Alto-Tietê Basin Agency</b>	<p>In charge of providing technical and administrative support to the Alto-Tietê committee. Among its attributions, the agency should be responsible for collecting water charges and elaborating an investment plan for its utilization.</p> <p>Currently it has very limited capacities and is not able to accomplish its mission.</p> <p><i>Funded by São Paulo Municipality and by occasional funds from public and private institutions.</i></p>
<b>Municipal government</b>  <i>Constitutional powers over land use, urban drainage, and water supply and sanitation</i>	<b>Municipal Secretariats of São Paulo city and other municipalities</b> related to urban water infrastructure and management issues	<p>Responsible for managing land use and occupation. Shares responsibility with state government for urban drainage and local environmental issues.</p> <p>São Paulo city is a member of all sub-committees in the basin.</p> <p><i>Funded by the municipal budget</i></p>
	<b>Municipal Water and Sanitation Services</b>	<p>Only a few municipalities are not supplied by SABESP and have their own local urban water supply services.</p> <p><i>Funded by water fees and municipal budgets. Limited recovery of O&amp;M costs. No financial or technical assistance from State.</i></p>



As elsewhere in São Paulo, fully working basin institutions have yet to be created in the Alto Tietê basin, mostly because the financial vitality of these bodies remains very limited. Between 1994 and 2003, the State Water Resources Fund—which is replenished only by royalties from the energy sector—has allocated R\$21 million (US\$8.07 million)<sup>15</sup> to the Alto-Tietê Committee. This is only enough to minimally sustain these basin bodies until the management system is fully operational.

Bulk water charges were supposed to be introduced in 1995/96, but the lack of political will to approve complementary legislation making that possible blocked the process. Since 1998, a bill on water charging has been pending in the state assembly and at several occasions, announcements that it will go to the floor have been made but not fulfilled (PL 20/1998 replaced by PL 676/2000). Other management instruments have advanced further. DAEE has actively issued water permits in recent years, especially for withdrawal and consumption. The number of water permits issued in São Paulo state as a whole ranged from 215 in 1994 to over 4,000 every year since 2002. The permits for effluent dilution have not yet been fully instituted, however.

All in all, the São Paulo management system can be characterized as reasonably advanced, even though the rhythm of implementation has been much slower than the initial process of approving the water law and creating the basin committees. This raises one question once again (Kemper, 1998): why is this process taking such a long time? One of the objectives of the next section seeks is to provide some answers to this question.

## **7. Participants' Motivations, Incentives, and Actions**

Water reform in São Paulo State and in the Alto-Tietê Basin has considerably changed the political scenario for water resources management at both the state and basin levels. Stakeholders that in the past were entirely excluded from decision-making—particularly municipalities, private water users and civil society—have come onto the political scene and important steps towards further decentralization have been taken. Despite these advances, we cannot, however, say that a change in the power positions of traditional stakeholders has yet occurred in a significant way. These actors continue to dominate decision-making.

Since the beginning of the water reform, two main issues have generated conflict at state level. First, different stakeholders have diverging opinions with respect to how far decentralization should go. The question that drives this debate is the final destination of revenues from bulk water charges (once they are implemented), with some arguing for more centralization at the state level and others holding that if basin agencies and committees are to be financially self-sufficient, then the proceeds should return to the basin of origin. Second, the difficulties mentioned above in implementing the pricing system for state waters has delayed the implementation of pricing, slowing the advancement of the overall water management system.

Here we will mainly discuss the way that some institutions or groups—DAEE, other state management agencies, public water and sanitation companies, industries and

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<sup>15</sup> US\$1 = R\$2.6 (April 2005).

irrigators— have acted and interacted in the new institutional context around these two issues. Problems related to stakeholder representation system also exist, both at state level, as briefly discussed below, and in the Alto-Tietê Committee. This latter set of problems are placed in the broader context of the basin participants' motivations and actions in Section 8.

**DAEE**, the state water management agency, has always been a key institution in São Paulo's water reform. DAEE *técnicos* led the reform by voicing concerns about the growing deterioration of water resources and the escalation of tensions between water users in several regions of São Paulo state, in particular the Alto Tietê and Piracicaba basins. This group was able to bring together all the state agencies involved in water policy, in particular the State Secretariat of the Environment (SMA) which provided much support for water reform during the 1980s and 1990s. Going beyond seeking to solve the main problems in the two basins, however, DAEE *técnicos* saw water reform as necessary if the agency were to carry out its formal water management attributions. Although in technical and financial terms, DAEE was the best-equipped water management agency in Brazil<sup>16</sup>, the absence of a water resources policy hindered its capacity to carry out these attributions in practice. DAEE has always held that it should be responsible for collecting bulk water charges and for centralizing part of the revenues at state level. Indeed, this was prescribed in the original draft bill that the executive branch presented to the state assembly in the early 1990s (PL 39/1991). Had this occurred, decentralization would have been very limited since the basin committees would essentially be consultative bodies, without their own administrative, technical or financial capacities (Formiga-Johnsson, 1998).

At the time that the final version of the law was being drafted, the struggle around the final destination of water charge revenues became very intense, with the involvement of actors traditionally excluded from water management — namely **municipalities, private water users, and civil society**.

These actors succeeded in introducing the river basin agency into the water law, although with the qualification that only basins with intense water-related problems and conflicts would have one. This would make it easier to guarantee the return of all revenues to the basin of origin<sup>17</sup>, since a basin agency would receive funds from water charging. This would give a basin-level institution some degree of financial and technical autonomy. Through the committee's control over the agency, local actors would also be better able to control how water charging proceeds would be spent than would occur if they depended upon the technical and administrative support of DAEE, which would otherwise manage the revenues and elaborate studies and basin plans.

The possibility that a basin could have an agency was later extended to all basin committees in the state. This was possible because the legal regulation of the water agency (and of the water law in general) occurs within the State Water Resources Council

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<sup>16</sup> The National Water Resources Secretariat (SRH/MMA) is currently conducting a study that shows that DAEE alone has more water technicians than all the other water management agencies in Brazil together (Personal communication of Maria Manuela M. A. Moreira, a senior official of SRH/MMA).

<sup>17</sup> The São Paulo law 7.663/1991 defined that up to 50% of the proceeds could be used in others basins with the previous agreement of the committee of the basin of origin.

(SRH), which involves a larger array of stakeholders (state representatives, municipalities, public and private water users, civil society). When the Piracicaba committee proposed a bill on the agency for its basin, all the mayors and local representatives in the SRH demanded that their basin should be allowed to have an agency as well. The ultimate result was a draft law that determined that all committees that wished to create an agency could. The specific legislation on basin agencies (State Law 10.020/1998) defined them very much as they are in the French system (*agences de l'eau*), i.e. they operate as the executive arm of the basin committees, providing administrative and technical support, elaborating basin plans, charging for water use, designing investment plans for spending the revenues collected from bulk water charges and accompanying the allocation of those funds.

After that law clarified the water agency issue, the power struggle around centralization *versus* decentralization moved to the discussion of the draft law on bulk water charges, which has been pending since 1998 in the São Paulo legislature. This law will, finally, define the remaining issues around the water charging system, including how much of the proceeds will return to the basin.

There are several reasons for this impasse. First, the main actor pressuring for water reform, DAEE, has no interest in seeing a water pricing law passed that calls for the full decentralization of the allocation of proceeds, as is proposed in the most recent version of the draft law<sup>18</sup>. Contrary to prior agreements in the State Water Resources Council and sometimes even in opposition to the position of the Secretariat of Water Resources, to which DAEE is subordinate<sup>19</sup>, DAEE has called for the centralization of some of the charge revenues to fund strategic investments defined in the State Water Resources Plan. This demand has intensified as DAEE has begun to perceive that if basin agencies are created in throughout the state, it will lose local influence and presence. Attempts to overcome this impasse have been made repeatedly, without success. DAEE is thus in a paradoxical situation. On the one hand, it is obstructing the implementation of the pricing system. On the other, it is the state agency most dedicated to promoting the new water management system, since it serves as the executive secretariat for 18 of the 21 basin committees in the state. As such, it provides technical and administrative support to the committees through its regional offices in this transitory phase. DAEE has also intensified the legalization of water use and the issuance of water permits. Together with the state environmental agency (CETESB), DAEE provides technical analyses of the investments that basin committees prioritize to be financed by FEHIDRO. It is also the main institution involved in the elaboration of the State Water Resources Plan, which occurs every four years and is the executive secretariat of CRH through CORHI (Coordinating Committee for the State Water Resource Plan and System), among other activities.

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<sup>18</sup> According to the draft law, (i) 10% of proceeds can finance the state system; (ii) 50% can be used in basins other than basin of origin, provided that the respective committee approves the transfer.

<sup>19</sup> In the discussion around the 1998 draft law on water charging, State Secretariats of the Water Resources and of the Environment defended a decentralizing approach, while DAEE maintained its centralizing proposal (Formiga-Johnsson, 1998).

Other public stakeholders seem to be more interested in the *status-quo*. Although it has never taken a formal position against water charging, the **State Secretariat of Finance** fears the political impact of creating a new “tax”. This agency has no interest in the decentralization of a substantial amount of public resources (see Section 9), which would escape its control if the committees and agencies determined their allocation. The State Water and Sanitation Company, **SABESP**, is also known to be reticent towards the pricing system as proposed in the draft law, although it has never taken this position formally<sup>20</sup>. This apparent resistance has a strong impact on the process. SABESP is a powerful actor in the state’s water policy sector, because of its technical capacity and because it supplies 70% of the state’s population, including 28 of Greater São Paulo’s 35 municipalities, São Paulo city among them<sup>21</sup>. Some believe that if it were in its interest, SABESP could promote consensus around reform among the upper echelon of the state government. However, despite major problems related to water source protection and water availability in some basins, especially Greater São Paulo, SABESP sees itself more as a user-payer than as a potential beneficiary of bulk water pricing. Currently, the Company is calling for a 50% reduction in the water charges the draft law would apply<sup>22</sup>. The Association of Municipal Water and Sanitation Services (**ASSEMAE**), however, has a different position: it accepts the proposal of water charging on the condition that the funds return to the basin and that the committees have the autonomy to decide how they are allocated (Miranda-Neto and Marcon, 2000).

It is more difficult to evaluate the motivations of other water management institutions in São Paulo. **CETESB**, the state pollution control agency, has devoted less attention to water reform than DAEE. Despite having a paramount role in water management, the agency initially played a passive role in the process. More recently, it has begun to participate more intensely (CETESB holds the executive secretariats of three state basin committees), but is far from a major actor in the politics of water reform. Conversely, the State Environment Secretariat-SMA, played a very important role early on in the process, supporting greater decentralization of the system. However, after undergoing a period of political difficulties in 1999-2002, SMA has participated less actively both in the basin committees and in water management in general<sup>23</sup>.

Generally, local stakeholders, private water users, civil society, municipalities, and basin committees strongly favor the total decentralization of revenues to the basin of origin, even if water pricing alone will not resolve needs for investments in water protection and restoration. Industrial and agricultural users particularly have made it clear that they do not want to pay water charges, despite the fact that these stakeholders often present more moderate views in writing (Thame, 2000 and 2004; and personal

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<sup>20</sup> These conclusions are based on Formiga-Johnsson, 1998, Carmigmani, 2000, and interviews with stakeholders in São Paulo State during field visit in June and October 2004.

<sup>21</sup> As noted in Table 3, SABESP is the largest water and sanitation company in South America, serving 25 million consumers in 368 municipalities in São Paulo State ([www.sabesp.com.br](http://www.sabesp.com.br), January 2005).

<sup>22</sup> Based on interviews with stakeholders in São Paulo State during field visit on June and October 2004.

<sup>23</sup> Most interviewees stressed that the Secretary of the Environment’s term between 1999 and 2002 was generally frustrating for the water reform: SMA *técnicos* were instructed not to participate in basin committees; and the motivated and committed team at SMA/CPLA, entirely devoted to water management issues, was dismantled.

interviews). It is also clear, however, that if water charges are implemented, they will only be palatable for these groups if the proceeds return to the basins from which they are generated and thus benefit those who pay. The fact that financial sectors in the government are likely to resist letting basin committees define how revenues are spent worries users nearly everywhere in the country, since paying water charges is only acceptable to them if it is not defined as a “tax” and if the money returns to their basin. Water charging is often compared to the CPMF, a federal tax on financial transactions which was originally to be used only to finance the health sector but which has since been diverted to other purposes. (Laboratório de Hidrologia/COPPE/UFRJ, 2002a and 2002b, Folha de São Paulo, 03/28/2005). The first national battle around this issue occurred when the federal Paraíba do Sul basin committee began to implement water charges, creating intense pressure to resolve the issue of returning revenues to the basin, at least at the federal level. A 2004 law guaranteed that the proceeds of charges for the use of federal bulk waters be used only for investments in water resources and in the basin of origin, except for 7.5% to finance the national system (Lei 10,188/2004).

The Federation of **Irrigators** (FAESP-Federação dos Agricultores do Estado de São Paulo) has always demanded that this group be exempt from water charging until rigorous studies prove that they can afford to pay. This group also calls for the establishment of a series of “prior conditions” before implementing water charging, such as a mobilization program and the full legalization of water use for the sector (Meirelles, 2000 and 2004). Differently from what occurred in the Paraíba do Sul Basin, in São Paulo, various civil society groups, and recently even industrial groups, support differential treatment for the agricultural sector, because of its economic fragility and the fact that water is such a large production input (see for example Abe, 2000; Lahóz and Brochi, 2004; Piva, 2004)<sup>24</sup>. This demand was quickly attended by the state government, which has defended exempting the agricultural sector during the first five years of water charging. This proposal is included in the current draft law on water charging (PL 676/2000 which replaced the PL 20/1998).

The **industrial sector**, through its powerful state federation (FIESP- *Federação de Indústrias do Estado de São Paulo*), has actively resisted the introduction of any charges for water use. Up to the mid 1990s, the industrial sector maintained a moderate position. It then began to aggressively and publicly lobby against water charging (see for example, Albiero Filho, 2000, Laboratório de Hidrologia/COPPE/UFRJ, 2002a). However, more recently, FIESP seems to have become less reticent and have even taken steps towards promoting water resources conservation and institutional reform (Piva, 2004; FIESP/CIESP, 2004; and personal communication of FIESP representative, October 2004). For example, FIESP has created a special capacity building program to promote user participation in basin committees and in the State Water Council. FIESP was also responsible for important changes in the pending draft law on charges, such as limit on charging for the use of water (withdrawal) for all committees, and compensation mechanisms for users that return water that is at higher quality levels than environmental

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<sup>24</sup> Although the charges are only symbolic, irrigators began paying in March 2003 in the Paraíba do Sul basin, which covers parts of São Paulo, Rio de Janeiro and Minas Gerais states. That agriculture not be excluded from charging was a precondition imposed by the both the water and sanitation and the industrial sectors. For details see Formiga-Johnsson, Campos, Canedo de Magalhães, *et al*, 2003.

laws require, among others (PIVA, 2004). This move away from resistance was first observed in the Paraíba do Sul Basin: after an aggressive start, FIESP actively participated into the discussions and, together with the industrial sector of other states, affected the shape of the pricing system. São Paulo industries that use federal waters in this basin have been paying water charges since 2003.

In the end, this shows the necessity of promoting greater user participation and giving them more say in water investment and management decisions. In fact, the users, often together with civic groups (user associations and other civil society associations share the segment called “civil society” in the São Paulo system), have been struggling for power in São Paulo since the beginning of the process. First, the segment had to win a place in the committee’s composition, since the state law left this question open, calling only for parity between state and municipal representatives; in the end, a tripartite composition was established with a third of the seats going to civil society (including private users). Second, civil society had to fight again for a broader representation in the state Water Resources Council. Initially, the segment had 11 seats but only one vote, while municipal and state representatives have 11 seats and 11 votes each; however, in 1994 the “civil society” segment was granted parity with respect to the two other segments. Currently, FIESP successfully demanded modifications in the pending draft law on bulk water charges that increased user representation on decisions related to water charging. If the final law does indeed incorporate this modification, the result will be quite strange, since the committee has a tripartite composition, but the distribution of voting power would have to change when the committee is deciding issues related to charging.

In summary, more than a decade after the passage of the state law (1991) and the creation of the first basin committees (1993/1994), the main political issues related to decentralization still have to do with the implementation of the bulk water charging system which requires a clear definition of the final destination of water charging revenues, and, in turn, the specific nature of the basin agency. The mobilization that occurred around the creation of the twenty committees between 1994 and 1996 was unprecedented in the history of water management in São Paulo state and, despite variations among committees, can be generally considered to be a process of great importance, especially when compared to earlier management practices (SMA, 1995 e 1998, and interviews)<sup>25</sup>. In the same way, the Water Resources Council (CRH) has been quite active since its creation, especially with respect to passing initial complementary regulations for the water law. None of this mobilization, however, has been sufficient to overcome the state government’s lack of political will on the issue of water pricing. Despite being the most studied and cherished management instrument in the new state system, discussions about water pricing have in fact never gone beyond the technical arena or the basin committee context. The need for a broader information and mobilization program, especially involving users and the state parliament—which has demonstrated little interest in approving the charges— seems crucial if vested interests that have been stalling the overall process so far are to be overcome.

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<sup>25</sup> Estimates are that in 1995 more than 1,000 people directly participated in the São Paulo management system (SMA, 1998).

## 8. Applying the Analytical Framework

Examining the factors identified in the analytical framework of Section 2 will contribute to our ability to understand the impact of decentralization on the Alto-Tietê River Basin and on Integrated Water Resource Management.

### 8.1. Initial Conditions and Contextual Factors

In the Alto-Tietê river basin and São Paulo State more generally, the context seemed favorable to the development of a decentralized and integrated water resources management system.

First, São Paulo state is by far the most important industrial and financial center of Brazil, generating almost 35% of the country's GNP in 1999 (R\$964 billion or US\$370.77 billion); it also had a per capita income of R\$9,210 (US\$3,542) in 1999, much higher than the Brazilian average of R\$5,740 (US\$2,208) (IBGE, 2000). In turn, the Alto-Tietê river basin is the richest Brazilian basin, since São Paulo city alone has the second largest GDP in Brazil, following only São Paulo State itself.

Second, in social terms, both the Alto-Tietê basin and the state as a whole was fertile terrain for reform: motivated by worsening water related problems, a result of intense urbanization and industrialization, social movements demanding improved water policies emerged in the mid-1980s, especially in the Alto Tietê and Piracicaba basins<sup>26</sup>. At the same time, at the national level an unprecedented movement within the technical water resource community —led in large part by *técnicos* from São Paulo— began to promote integrated water resources management. Ideas and experiments related to integrating sectoral policies involved in water management at the river basin level began in the 1970s, in the Alto Tietê basin and elsewhere in the country. During the period of democratic transition that followed the fall of Brazil's military regime in the mid-1980s, the ideas about integrated river basin management were associated with the values of democratization, decentralization, and civic participation in policy making. It was on the basis of this technical and social capital that the water management agencies of São Paulo State began to pioneer a process of institutional transformation, introducing new legal concepts such as water use rights, pricing, river basin level management and planning, and stakeholder participation (Formiga-Johnsson, 1998).

The initial distribution of resources among basin stakeholders also seemed to favor reform. The main users are the urban water supply companies, which face serious problems of supply and growing demand. These problems should be an incentive for changes in water management practices, since the integrated approach has become vital for the rational use and sustainability of water resources in the basin. On the other hand, irrigators -- traditionally the water users that are most resistant to changes, and especially to water charging -- use an almost insignificant amount of water in the Alto Tietê basin, although they are a major user at the state level<sup>27</sup>. Industries is the second largest user in the basin.

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<sup>26</sup> An in-depth analysis of the societal movements, and of the São Paulo system's construction and its interface with the national water management system can be found in Formiga-Johnsson (1998).

<sup>27</sup> While irrigation in the basin uses only 2.56 m<sup>3</sup>/s, the sector uses 101.56 m<sup>3</sup>/s in São Paulo as a whole.

Despite this favorable context, the political will to advance the changes has proved insufficient to overcome the resistances and fears of the stakeholders discussed above. The political and environmental complexities of the Alto-Tietê basin seem to make it particularly difficult to implement practices involving integration and participation of decision making.

## ***8.2. Characteristics of the Decentralization Process***

The decentralization process in the Alto-Tietê basin is marked by two distinct processes: i) decentralization from the state to the basin level, which occurred with the creation of the Alto-Tietê Committee in 1994 and, more recently, its water agency; ii) further decentralization within the basin in 1997/1998, which resulted in five sub-committees at lower territorial levels.

As discussed in Section 7, while the devolution of authority and responsibility from the state level to the basin level was desired by both state government and local stakeholders, there is no agreement about the extent of this decentralization, *i.e.* the financial autonomy and capacities of the river basin bodies.

The need to decentralize within the basin, however, had consensus from the earliest stages of mobilization for the creation of the Alto-Tietê basin committee (Rocha, 2002). Although the Alto-Tietê is a small basin in physical terms, state and local stakeholders recognized that the complexity of such an intensely urbanized and industrialized region required smaller scales for management. Some have disagreed with the methodology used to define the five sub-committees that were created, because they were not based on purely hydrological criteria. But no one questions either the need to create complementary deliberative bodies at lower levels or the fact that basin management participants should be allowed to create and modify institutional arrangements according to their needs and circumstances. The fact that there is no conflict between the responsibilities of the central committee and the subcommittees demonstrates that the decentralization that occurred is satisfactory for both sides (the center and the local levels), even though interviewees did suggest that some difficulties in coordination do exist.

## ***8.3. Central-Local Relationships and Capacities***

The water reform in São Paulo State has been as much a matter of building the institutional capacities of state government and of integrating sectoral policies, as it has been about decentralizing water management. Prior to reform, São Paulo already had management institutions well-equipped with a highly qualified technical corps. For this reason, unlike other states where reform started with creating new institutions, in São Paulo, the main issue was not to initiate water management altogether, but to develop a culture of integrated management among technical state officials and to build capacities in new management practices in which decision-making would be shared with new actors<sup>28</sup>. A decade after the process began, substantial improvements can be observed,

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<sup>28</sup> São Paulo is one of the few exceptions to a recent phenomenon in Brazilian state government, in which most qualified *técnicos* in water management are consultants, usually paid through international agencies. This situation is particularly common in the Northeastern state, where there is a strong tradition of federal intervention in drought control policy and public works construction. Only recently have these states



ranging from the integration of the information systems and actions of the various agencies at the level of common territorial boundaries (basins, sub-basin or part of a basin), to the elaboration of water resources plans at both the state and basin levels that reflect more comprehensive and higher quality understanding of water problems. Above all, considerable advances occurred in water use controls through the implementation of a new water permit system, even though monitoring and control is still not systematic (Baltar, Azevedo, Rêgo and Porto, 2003). Little by little, the water permit has moved from being merely a bureaucratic tool to becoming a strategic element in water resources management and control. Water permits will take on even greater importance with the implementation of bulk water charges. Volumetric charges will not apply to actual uses but rather to the size of water use permits, as occurs in the Paraíba do Sul basin and different from the French model that inspired the reform. The link between charges and permits in Brazil is partly conceived as a way to promote a greater association between permit requests and actual needs, since in the absence of a water pricing mechanisms, users often request permits for volumes above what they plan to use.

Until the system is fully operational, other capacities that eventually should develop at the river basin level remain in the purview of state agencies. On the one hand, the main state institutions—SMA, CETESB and particularly DAEE— have been providing technical and administrative support to the basin committees, since either CETESB and DAEE hold the post of executive secretariat in each one. This kind of regular support is not common in Brazil. On the other hand, a state Water Resources Fund (FEHIDRO- *Fundo Estadual de Recursos Hídricos*) has been providing small but regular amounts of money to all basin committees. Among the different sources that are legally supposed to pay into FEHIDRO, only the royalties that São Paulo State receives from hydropower companies using waters in its territory have actually entered the fund. Between its establishment in 1994 and 2003, FEHIDRO has financed about R\$208.6 million (US\$80.23 million) in projects and activities approved by the basin committees. Taken together, all 21 basin-committees receive almost R\$21 million (US\$8.08 million) per year on average<sup>29</sup>. The Alto-Tietê basin receives an annual average of less than R\$2.3 million or US\$885,000, which is divided between the main committee and the sub-committees (one third and two thirds, respectively)<sup>30</sup>. Despite the modesty of these figures when compared to investment needs, São Paulo is the only state in the country that channels energy sector royalties into a fund which is completely used for investments selected and approved by basin committees.

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developed some of their own institutional capacity, a result of current reforms (Garjulli, 2001). Hiring consultants is a temporary solution to the lack of technical capacity of state management institutions. Unfortunately, it leaves them extremely fragile, since they have less incentive to build their own qualified professional corps. The federal government only acquired its own technically and financially autonomous water management agency with the creation of the National Water Agency in 2001, responsible for implementing the national water resources policy.

<sup>29</sup> US\$1 = R\$2.6 (April 2005).

<sup>30</sup> A study conducted by Alvim (2003) showed that the projects are relatively well distributed geographically among the areas of influence of the various decision-making bodies: 16% were destined to projects proposed by the main committee; 26% to the Cotia-Guarapiranga sub-basin; 18% to the Tietê-Cabeceiras sub-basin; 15% to the Billings-Tamanduateí sub-basin; 13% to the Juqueri-Cantareira sub-basin; and 12% to the Pinheiros-Pirapora sub-basin.

In short, the advances in state water management capacity have been considerable and in some cases crucial for the survival of the basin committees in this transitory phase. However, tensions and problems exist between the central authorities and the local bodies and, as the Alto Tietê case exemplifies (see next section), basin committees are not always effective. Indeed, the São Paulo water resources management system as a whole is beginning to show signs of breakdown in face of the state government's incapacity to make it fully operational, especially by implementing bulk water charges. Water reform in São Paulo seems to need much more time than even the most pessimistic initial predictions expected. Considering that the reform process is almost fifteen years old, it is becoming clear that transaction costs are very high in terms of time and money.

#### **8.4. Internal Basin-Level Institutional Arrangements**

All of the new institutions defined in the water law have been formally implemented in the Alto-Tietê basin. However, their operation is still marked by imprecision and institutional overlaps.

A good definition for the current situation of the Alto-Tietê committee was given during the site visit by an interviewee deeply involved with the water reform: "The Alto Tietê committee is a social force, but has yet to become a forum of decision-making about the problems of and solutions for the basin"<sup>31</sup>.

Indeed, the dynamics of the Alto-Tietê committee have undergone advances and setbacks since its creation in 1994, largely a result of the varying performance of the public representatives holding the committee's presidency and executive secretary of the committee (Keck and Jacobi, 2002)<sup>32</sup>. During one highly dynamic term (between 1997 and 2002)<sup>33</sup>, for example, the committee was able to promote a broad integrated urban drainage policy for Greater São Paulo, a field restricted until then to isolated investments. The committee has also been used as a space for discussing metropolitan issues related to water and land use. It has thus served to compensate for the lack of a metropolitan planning institution, which was planned to be created at the end of the 1980ies (personal interviews). For instance, the Alto-Tietê committee sponsored, in conjunction with other well-organized local institutions— the Greater ABC Inter-Municipal Consortium<sup>34</sup>, and the *Movimento de Defesa da Vida* (Movement for the Defense of Life) — a two-year process of public hearings and debates on the revision of the Headwaters Protection Law. The new law drew heavily on this discussion, which in the eyes of both state

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<sup>31</sup> Stela Goldenstein, former State Environment Secretary and former Environment Secretary of São Paulo city (*Secretária do Verde*), June 2004.

<sup>32</sup> The study conducted by Keck and Jacobi in the context of the Watermark Project describes in length the dynamics of the Alto-Tietê Committee between 1997 and 2001, within the broader institutional context and the process of social mobilization and organization.

<sup>33</sup> Most interviewees stressed that the Committee was more dynamic when Hugo Marques da Rosa was its executive secretary and later president, and Gerônimo Albuquerque Rocha was supporting the Alto-Tietê's secretariat (including one term as executive secretary).

<sup>34</sup> The consortium was created in 1990 by seven municipalities to promote coordinated action for regional development, with a strong emphasis on environmental issues, solid waste management, and water source protection.

representatives and civil society organizations was necessary to give legitimacy to proposals on a highly controversial issue (Keck, 2002).

Despite these advances, the committee has generally had difficulty in becoming a forum for the debate and design of solutions for water-related problems. Most interviewees stressed that state institutions (including SABESP and DAEE) make major decisions on water development, use protection and on important infrastructure without going through the committee. At best, the committee has been informed about projects that have already been approved. In 2001 for example, without previous consultation with the committee, the state government presented a plan to the media to implement a broad pollution clean-up program in one tributary of the Tietê, the Pinheiros River. Since many stakeholders in the basin believed that the committee would only fulfill its mission if it could have a say in such major investments in the basin, mostly financed by international agencies<sup>35</sup>, this practice was extremely frustrating. This experience demonstrates well how difficult it is to overcome centralized decision-making traditions. Gaining influence over state programs constitutes the main challenge for all basin committees in Brazil, especially for those with little or no capacity for implementing a water pricing system.

Recently, the situation has apparently worsened<sup>36</sup>. All interviewees noted that the committee has recently lost dynamism and that it has become entirely dominated by the issue of allocating FEHIDRO funds. Impasses in the representation system were also noted, especially concerning civil society representatives, which are divided among environmentalists (with a fragile social base) and residents of water source protection areas, neighborhood associations, and unions. It seems that these groups have little insertion among the populations they supposedly represent. As such, they have little power to force changes that are not in the interest of the government. Another important issue was indicated by many interviewees: in recent years, there has been a polarization within the Committee between clearly identifiable (antagonistic) political party positions. The committee has thus often become a stage on which the disputes among political groups seeking electoral office are played out.

The committee has even failed to take initiative on crucial issues such as the 2004 renewal of the water concession for diverting water from the Piracicaba to the Alto-Tietê basin, which provides almost half of the publicly supplied water for Greater São Paulo. In the absence of a committee position on the question, the Alto-Tietê agency took initiative and presented its own, so that the basin would not be totally missing from the discussion. This again occurred, however, without previous consultation with the committee.

In this way, a peculiar arrangement has been established— that will last at least until March 2005, when the current committee term ends. The main committee mainly discusses the allocation of FEHIDRO funds. The basin agency, which does not have much technical capacity, is taking on the role of the committee for other issues, actively participating in debates about water management questions affecting the basin. DAEE

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<sup>35</sup> Greater São Paulo received major funding for water, sanitation, and storm drainage projects, especially in the last decade, from several international agencies such as IDB— Inter-American Development Bank; IBRD - The World Bank; EIB – European Investment Bank; KfW - Kreditanstalt für Wiederaufbau (Germany); JBIC - Japan Bank for International Cooperation.

<sup>36</sup> Keck and Jacobi (2002) already observed a significant decline in committee dynamism in 2001.

provides technical and administrative support to the main committee (which should be the role of the water agency) and will probably continue to do so until the agency becomes financially independent —and thus, effectively operational— with the institution of water pricing.

The subcommittees are generally considered more dynamic, more effective and more important than the main committee (Alvim, 2003, Cunha, 2004, personal interviews), although with variations among them. The Cotia-Guarapiranga and the Billings-Tamanduateí subcommittees are the most mobilized and active. This can be partly explained by the fact that these two areas were already mobilized around water resources and environmental protection, before the subcommittees were created<sup>37</sup>.

The most important role of the subcommittees is to deal with one of the most serious water related problems of the basin (and the most difficult one to resolve): making water resources protection and urban expansion compatible through the implementation of the State Headwaters Protection Law of 1997. This includes conceptualizing a broad policy for water source protection and restoration through the elaboration of specific laws for each sub-basin. The Headwaters Protection law recognizes that simple prohibition and policing measures for protecting strategic water supply sources — such as those defined in the previous law which was created in the seventies— have had perverse effects (Kemper, 1998). This new approach also represents a dramatic departure from São Paulo's traditional sectoral approach to water quantity and quality, which separated the management of water from its environmental aspects, especially water pollution and land use. So far, one sub-basin Headwaters Protection Law (the “Specific Cotia-Guarapiranga Law”) has been drafted (2001) and is under discussion in the state legislature. The Billings-Tamanduateí sub-basin is also in advanced stages of drafting its own specific law.

Despite this promising start, however, the implementation of such policies will likely face significant difficulties, since reaching the proposed goals depends on the capacity and will of municipal authorities to improve their urban regulations so as to guarantee the control and monitoring of land use in the sub-basins. The solution for these problems in the Alto-Tietê basin may thus be beyond the capacity of the riverbasin bodies and the water resources management system as a whole, since it will necessarily involve sectoral policies in the areas of housing, transportation, and employment. Such policies would have to have an environmental focus and work in tandem with protection efforts.

## **9. Performance Assessment**

In this section, we discuss the performance of the basin institutions created, focusing on three factors often cited as crucial for effective decentralization: devolution of authority, stakeholder participation, and financial self-sufficiency. We also examine the extent to which changes in decision making have had an impact on the physical environment.

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<sup>37</sup> The basin that contributes water to the Guarapiranga reservoir earlier mobilized around the Guarapiranga UGP (Project Management Unit - World Bank). The Billings reservoir has produced the most influential regional mobilization: the Inter-Municipal Consortium of the Greater ABC.

### ***9.1. Devolution of Authority***

Considering the fact that the state government does not discuss major projects with the committee, it is clear that devolution of state authority over water management issues to the Alto-Tietê committees has been very limited thus far. The problem, it should be noted, is not just resistance to devolution on the part of the state government: the main committee has also failed in recent years to engage in the most important issues for the basin, as noted in the previous section.

Decentralization within the basin (from the main committee to the sub-committees) has, however, been very effective in the Alto-Tietê basin. The sub-committees are making important local decisions and these have been systematically confirmed by the main committee, even though improvements are still necessary in this relationship (Alvim, 2003; Rocha, 2004; personal interviews in June 2004). In general, the sub-committees are not only more dynamic, but also seem to have more stability, continuing active despite the current “crisis” of the main committee (personal interviews). This strongly suggests that decision making over water management issues in very dense and urbanized areas seems to be more appropriate at lower levels than the usual river basin. This observation is especially important in the Alto-Tietê context – a hydrographic region that encompasses only the very upper part of the basin. At the time it was created, the reformers believed that a region of that size would be small enough to ensure that a committee could face the magnitude of São Paulo city’s problems. It is also easier to find a strong common interest and greater incentives to organize at lower levels than in the basin as a whole. The main committee brings together a much larger array of difficult to coordinate problems and interests. Since the government has failed to include it in decision-making, it is also perceived as less politically relevant and therefore has less mobilizing power than the local committees<sup>38</sup>.

In varying ways, water reform has touched more than one municipal government in the Alto-Tietê basin. Since municipalities are responsible for land use and urban drainage, this occurs largely through the sub-committees’ discussion of water source protection and pollution control.

### ***9.2. Stakeholder Participation***

The creation of the Alto-Tietê committee and the sub-basin committees has promoted the involvement of hundreds of stakeholders of all types, in particular municipalities, private users and organizations of civil society. As should be clear by now, local stakeholders, however, still have no say in some decisions that affect them directly.

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<sup>38</sup> “Despite these considerations, the perspective of the river basin as a whole should be permanently developed. During the elaboration of the São Paulo State Water Resources Plan for 2004-2007, various Committees were asked to prioritize the state goals in two phases. First, they apply the logic of their management unit. Then they consider the demands of the other committees in the same hydrographic region and re-evaluate their own priorities from that larger perspective, seeking consensus with the latter. This double perspective enriches the comprehension that committee members have of their own water resources management unit, at the same time that it increases the need to seek out a broader understanding of their problems.” (Personal communication of Ney Maranhão, consultant of the São Paulo State Water Resources Plan 2004-2007, in November 2004).

A comparison of studies on the dynamics of stakeholder participation suggests that there are similarities between the central committee (Alvim, 2003) and the Guarapiranga and Billings sub-committees (Cunha, 2004). In her in-depth study about the Alto-Tietê, Alvim (2003) notes that the participation of the different segments raises a problem. The state government, through the Water Resources and Environment secretariats and the management agencies under them (DAEE and CETESB), dominates not only agenda setting but also the outcomes of the discussions in both the main committee and the subcommittees. Municipal participation, in turn, tends to be much more intense in those sub-regions where they were previously organized around some regional issue, for example, the Inter-Municipal Consortium of the Greater ABC, in Billings region, or the Guarapiranga *UGP* (Project Management Unit - World Bank).

Cunha's (2004) analysis of social networks in the Guarapiranga and Billings sub-committees confirms this tendency, adding that actors from the state and municipal governments interact strongly while civil society representatives are clearly marginalized from decisions.

### ***9.3. Financial Self-Sufficiency***

The funds available for the Alto-Tietê basin —an annual average of less than R\$2.3 million or US\$885,000 million— have been enough to provide minimal financial sustainability for all the basin's committees. The basin's water management needs are, however, estimated at about R\$5.3 billion (US\$2.04 billion ) for 2001 to 2010. Of this total, 97.2% refers to services and infrastructure and 2.8% to management activities (FUSP, 2002a).

Preliminary simulations made by São Paulo State (CORHI, 1997) have, however, noted that the Alto Tietê has the greatest potential among São Paulo basins to generate revenue through charging for water use. Indeed, the National Water Agency (ANA) is currently conducting a study that suggests that this basin would be able to collect more revenues than any other in Brazil<sup>39</sup>. The São Paulo bulk water charge system proposed in the draft state law under discussion is quite similar to the French system<sup>40</sup>, except in that it directly links charges to the volume of water for which the user has a water use permit. The proposed charging system can be briefly described as follows (CORHI, 1997)<sup>41</sup>:

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<sup>39</sup> Personal communication of Patrick T. Thomas, an official of the Superintendência de Outorga e Cobrança of the National Water Agency (ANA), in February 2005.

<sup>40</sup> The French bulk water charge system, created at the end of the 1960s, is based on three water uses: withdrawal, consumption, and effluent discharges. Each use has a basic charge, which can be increased by any of a number of multiplier coefficients that take local specificities into account, such as type of water source (surface or groundwater), location (water source protection areas, etc.). Note that pollution is charged according to the pollution load. This is quite different from using effluent dilution (i.e., the volume of water needed to reach the concentration of pollutants set by standards in the water body where effluent are released) as occurred in a simplified form in the Paraíba do Sul River basin, and as has been proposed by several Brazilian studies (see, for instance, Laboratório de Hidrologia e Estudos do Meio Ambiente/COPPE/Universidade Federal do Rio de Janeiro, 2004).

<sup>41</sup> Currently, a study is underway that will re-evaluate the charging system proposed in a 1997 study by CORHI. This new study, expected to be completed in 2005, may propose changes in the charging methodology and criteria.

- all water use (withdrawal and consumption) and effluent discharges (BOD - Biological Oxygen Demand, COD - Chemical Oxygen Demand, sediment residue and inorganic discharge) are subject to pricing;
- different basic charges for type of use (withdrawal, consumption, and effluent discharges) were defined per unit of water (Table 4);
- several multiplier coefficients were established to take local specificities into account, such as type of water source (surface or groundwater), seasonality (wet or dry seasons), location (water source protection areas, etc.);
- the final charge (“basic charge” X coefficients) should have a ceiling (“maximum charges”) to avoid having significant impact on users (Table 4);
- all water users should be charged (first: industrial and municipal; five years later: irrigation and others).

**Table 4: Proposed Bulk Water Charges In São Paulo State**

Water use	Unit	Water charges			
		Basic charges		Maximum charges	
		R\$	(US\$)	R\$	(US\$)
Withdrawal	m <sup>3</sup>	0.01	(0.0038)	0.05	(0.0192)
Consumption	m <sup>3</sup>	0.02	(0.0076)	0.10	(0.0385)
Effluent discharges					
<i>BOD</i>	kg DBO	0.10	(0.0385)	1.00	(0.3846)
<i>COD</i>	kg DQO	0.05	(0.0192)	0.50	(0.1923)
<i>Sediment residue</i>	liter	0.01	(0.0038)	0.10	(0.0385)
<i>Inorganic discharge</i>	kg	1.00	(0.3846)	10.00	(3.8462)

\* US\$1=R\$2.60 (April 2005)

Source: CORHI, 1997.

Studies carried out by CORHI in 1997, based on this proposal<sup>42</sup>, predict the potential annual revenue of water use and pollution charges in the Alto-Tietê River Basin to be R\$178 million (US\$68.46 million) (CORHI, 1997).<sup>43</sup> However, it is estimated that over a third would go to the other basins that provide water to Greater São Paulo: the Baixada Santista and, above all, Piracicaba-Capivari-Jundiaí. The draft law requires that another 10% be used to finance the state system. The potential revenues that could be used for investments in the Alto-Tietê basin is, therefore, approximately R\$106.8 million (US\$41.07 million) a year, based on the assumption that all collected charges do, in fact,

<sup>42</sup> The simulation for the Alto-Tietê considered that industrial users, urban users and irrigators would pay. All the coefficients were equal to one.

<sup>43</sup> Two other simulations were carried out later (1999 and 2001): one reached the same estimated revenues collected, but the second estimated only about R\$110 million (US\$42.31 million) per year (FUSP, 2002a).

return to the basin. This means that revenues from water charges would still be insufficient for ensuring the basin's financial self-sufficiency, covering only about 20% of annual investment needs<sup>44</sup>.

In conclusion, even though the water charges will not guarantee full financial self-sufficiency, they will constitute a strategic foundation for the decentralized management system in the Alto Tietê basin.

#### ***9.4. Changes in Riverbasin Management Outcomes – Strengths and Weaknesses of the Institutional Arrangements in the Alto-Tietê River Basin Case***

Although it is still too early to allow for a complete analysis of the physical impact of decentralization in the Alto Tietê basin, a series of changes can be noted.

**Decision-making regarding investments.** Given the small amount of funds available, the committee's strategy has been to give priority to non-structural projects (rationalization of water use, demand management, capacity building, environmental education, etc.), leaving traditional state agencies (SABESP, DAEE, etc.) to carry out large scale infrastructure projects<sup>45</sup>.

**Water permits.** DAEE has intensively and progressively issued water permits in São Paulo State, since the beginning of the reform. Another important advance was the integration of the two management agencies. DAEE now consults CETESB when it is issuing water permits and CETESB takes DAEE's water permits into account when authorizing effluent discharges.

A recent World Bank study (Baltar, Azevedo, Rêgo e Porto, 2003) emphasizes that knowledge about water resources in São Paulo state is strong, thanks to DAEE's institutional capacity. To support the water permit system, DAEE has about 150 field officers and 40 others in the São Paulo headquarters, much more than any other state in Brazil<sup>46</sup>. However, the Bank study also pointed out that there is still a need for regular monitoring and control, which occurs only in the case of complaints by third parties.

**Water resources protection, urban land use, and environmental policy integration.** The Alto-Tietê committee and subcommittees will probably face difficulties in approving and implementing the specific laws and programs they are elaborating in conjunction with State Headwater Protection Law of 1997. However, the importance of this initiative goes beyond the fact that a major problem has been openly discussed and politicized.

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<sup>44</sup> Nevertheless, the needs estimate took into account some sanitation and drainage projects which have funding already guaranteed by executing agencies —DAEE, SABESP, municipal water and sanitation companies—, in some cases with the participation of international agencies.

<sup>45</sup> The most important of these investments is the Tietê River Pollution Control Projects financed by the Inter-American Development Bank (IDB). Its overall objective is to improve the environmental quality of the Tietê basin in metropolitan São Paulo, conserving and making efficient use of water resources in the upper reaches of the basin, including a pilot program to reduce unaccounted water losses. The project was the first in a series of three projects financed by the IDB, launched in 1991. The second phase, which started in 2000, is yet to be concluded, but a new major phase is under negotiation, for the clean-up of the Billings reservoir.

<sup>46</sup> Some of the DAEE officials (especially in the state interior) also provide technical support for urban drainage management in the municipalities.



This new policy is one of few cases in Brazil where water policy is integrated with more traditional environmental policies. It is also the first major attempt to integrate land use, urban development and water resources management in heavily urbanized areas in the country.

**Urban Flooding.** The new concept for a macro-drainage plan which integrates both municipal and state plans and programs, and proposes technical, economic and environmental solutions is one of the most important contributions of the Alto-Tietê committee. However, the elaboration of this plan, under preparation since 1998, has undergone several periods of paralysis, one of which is occurring currently. The studies that have thus far been carried out propose a series of structural and non-structural interventions on the order of US\$384 million<sup>47</sup>. Another project of more or less the same size, proposed by an earlier plan, is already underway with funding from the Japanese government.

**Sewage collection and treatment.** The massive investments in treatment and collection began before the institution of a new water management system in São Paulo, in the 1970s. SABESP estimates that the sewage gap will decrease substantially in the next years reaching 17% in 2005, 10% in 2010, 8% in 2015 and 7% in 2020. Even so, approximately 1.4 million inhabitants will remain unattended in 2020, a substantial number in absolute terms. There are no estimates for increases in wastewater treatment (FUSP, 2002b).

**Water quality and environmental concerns.** As has already been noted, massive investments in sewage collection and treatment have not been enough to improve water quality in the strategic reservoirs in the Alto-Tietê basin, where quality levels are stable or declining. The only exception is the Billings Reservoir whose quality has been improving dramatically since the reversal of the polluted water from the Pinheiros River into the reservoir by the electricity company was restricted, in 1992. This was a victory for several movements that got involved in water reform with the objective of protecting the reservoir for supply purposes.

### ***9.5. Other Perspectives on the Decentralization Process in the Alto-Tietê Basin – The Way Forward***

The above discussion has made it clear that the Alto Tietê basin still needs to advance in the clear definition of roles and relationships among the various organizations involved in river basin management. If both the basin agency and DAEE must act as executive secretary during this transitory phase, then their activities should at least be better integrated. The basin agency and the main committee (which is, officially, supposed to have authority over the agency) should coordinate discussion on the main problems and solutions in the basin. The sub-committees also need to coordinate better with the main committee in an integrated management system to be created at basin level. The main challenge is to transform the Alto-Tietê committee from only a “social force” into an authoritative arena for decision-making. This challenge is even more important in the current context, in which the dynamism of the main committee has declined.

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<sup>47</sup> US\$1= R\$2.6 (April 2005).

In order for the water management system to be effective, a bulk water pricing system must also be implemented. The importance of pricing is two-fold. First, it will be fundamental for promoting the rational use and sustainability of water resources in the basin. This is especially important considering the lack of enthusiasm for a strong program of demand management, and of a worrisome overexploitation of groundwater resources. Second, by providing basin institutions with financial autonomy, the pricing system will make the committees more viable. Since it is likely that charge revenues will be accompanied by high value investments, they will also contribute to building integrated management, with the participation of the major users and agencies who have until now paid little attention to the committee in the design and implementation of their own investments. However, as noted before, this issue extrapolates to the river basin level. It is a challenge at the state level, perhaps the most important one.

## **10. Lessons Learned**

The Alto-Tietê River Basin brings up many interesting questions around the issue of integrated water resources management at the lowest appropriate level. The analytical framework developed for the overall research project of which this study is part (section 2) suggests that the political and institutional conditions in São Paulo and the Alto-Tietê basin (sections 8 and 9) should have been favorable to the development of integrated and participatory management. However, almost 15 years of reform have not been sufficient to make the new water resources management system fully operational anywhere in the state. The process is still underway and, in the Alto-Tietê basin, the outcomes have been much less impressive than most observers – and participants - expected.

This paper has examined why these changes did not occur as expected. Implementation has taken the “path of least resistance”, advancing only in areas that have been less costly in political terms, such as creating regulatory bodies (the state council and the basin and sub-basin committees), the elaboration of water resources plans, and the execution of a new water permit system. However, when it came down to more controversial issues such as water pricing, political will weakened in the face of resistance from various government actors and organized user groups. One conclusion therefore is that the state did not have a strong enough “champion” in the state government, with the political clout and determination to go further on the decentralization agenda. Nor does the state parliament seem to be convinced that charging for water is both useful and necessary for promoting rational use and giving a minimum of self-sustainability to the water resources management system. Thus, the major obstacles to integrated management and implementing water charges in São Paulo are both the lack of political will on the part of authorities and, even more importantly, the opposition of vested interest groups, such as the major bureaucracies that do not want the system decentralized, and some industrial user groups that demand high quality water supply but do not want to pay for it. One possible solution is to give these groups greater decision-making power in the process.

Charging for water is one of the key issues that would make the Alto Tietê Committee more relevant, giving it more say in water investment and management decisions. As long as such decisions remain at the level of each individual agency (both state and municipal), decision making remains fragmented and also key policy

instruments to curb water demand increases and pollution are not implemented and used. Water charging has only been implemented in Brazil (Ceará State in 1996, the Paraíba do Sul riverbasin in 2003, and Rio de Janeiro State in 2004), where a strong and determined public actor mobilized to overcome the skepticism and active opposition of both government agencies and water users. In Ceará State, this was only possible because water management reform and the implementation of bulk water pricing were at the top of the state's political agenda. The proposals fit closely into a broader reform in the state's administrative structure, promoted by a government with an entrepreneurial orientation and strong support from the World Bank (Kemper and Olson, 2000). In the federal Paraíba do Sul river basin, the National Water Agency (ANA), together with the basin committee, took a strong stand in favor of the full implementation of the water management system. This demanded an intense effort by ANA both to make clear to the water users, especially industrial users, that the initiative was to be taken seriously and that they should be important part of it, and to convince the federal government that pricing should not be treated as an ordinary tax (Formiga-Johnsson, Campos, Canedo de Magalhães *et alli*, 2003).

Those advances that have occurred in the Alto Tietê basin are largely a result of the great enthusiasm and commitment of the state *técnicos* who fought for the new water management model. Early on in the reform process, the *técnicos* were able to obtain powerful allies who helped convince the state governor to buy into their ideas. The reform's promoters were able to get the Inter-American Development Bank to consider the law's enactment to be a precondition for approving the Projeto Tietê by the Inter-American Development Bank (Abers and Keck, forthcoming).

The lack of government commitment to the process is not enough, however, to explain the lackluster performance of the Alto Tietê committee. The conditions just described apply to all of the basin committees in São Paulo State. Some of these, however, have advanced further than the Alto Tietê, such as the Piracicaba-Capivari-Jundiá and the Litoral Norte committees<sup>48</sup>. Several peculiarities of the Alto-Tietê context made it even more difficult for river basin bodies to take advantage of their favorable conditions and to take the lead in coordinating water management. First, the extent and intensity of water-related problems (and solutions), typical of highly dense and industrialized regions, represent an enormous technical, political and financial challenge. Under these conditions, it is harder for stakeholders to identify common interests. Second, the peculiar composition of the AT committee -- which included among its members powerful state government agencies and the government of São Paulo municipality -- has so far proven to be more of a problem than an advantage. These influential institutions have not needed to take the committee seriously thus far and it is unlikely that they will throw their energies into committee activities until the pricing

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<sup>48</sup> Despite the tradition in São Paulo state to manage the federal water in its territory, the National Water Agency intends to implement the bulk water pricing system in the Piracicaba basin, a federal river that is a tributary of the Tietê river; the Piracicaba basin is the most mobilized around water management issues in São Paulo state and includes several very active river basin bodies (an intermunicipal consortium and two basin committees). The Litoral Norte Committee has proved to be a very dynamic, especially with respect to promoting integration among segments (state, municipalities and civil society) and between water resources management and other water-related policies.

system is implemented, as occurred with many powerful stakeholders in the Paraíba do Sul river basin case.

Both the intensity of problems and the lack of mobilization of crucial committee members seem, however, to lose importance at a lower level of management. Interestingly, though, while the main committee still tries to define its roles and powers, the sub-committees have found strong reasons for working. As fora for elaborating and implementing the water source protection policy at the local level (among other attributions), the sub-committees serve as strong building blocks for integrated management in the basin. Indeed, the lowest appropriate level for many water management functions turned out to be even smaller than the original division of the Tietê river basin into five regions. The sub-regions that were created in the Alto Tietê basin can be defined as “social catchment” areas, combining socio-economic and environmental interests and identities with the region’s political and natural hydrological divisions (Kemper, 1998)<sup>49</sup>.

Another conclusion of this paper is that important achievements have been made, though the decentralization process has yet to reveal measurable physical results such as the improvement of water quality or the rationalization of water use. It is undeniable that the Alto-Tietê committee and its subcommittees have already played an important leadership role around several issues. Above all, an extraordinary mobilization around water issues, problems and management has occurred, even though solving many water-related problems may be beyond the capacity of the committees or even of the water resources management system as a whole.

Finally, it should be stressed that the decentralization model, first developed by São Paulo and later confirmed in the federal legislation and most state laws, is well adapted to the conditions of the Alto-Tietê basin. It is there—in the Brazilian state that has the richest, best qualified and most experienced water management institutions—that the model centered around the river basin committees and basin agencies, with financial sustainability guaranteed through bulk water pricing, has the best conditions to be successful. However, implementing this model has proved slow, arduous, and generally challenging. So much so, that the pioneer state in water reform has begun to lag behind others.

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<sup>49</sup> Kemper defines “social catchment” as a management unit within the larger hydrological basin, with common economic and social concerns; the social catchment concept permits the interests of local stakeholders to be taken into account and relates their interests and incentives to the natural environment.

## Acronyms

ANA National Water Agency (*Agência Nacional de Águas*)

ASSEMAE National Association of Municipal Water and Sanitation Services (*Associação Nacional dos Serviços Municipais de Saneamento*)

BOD Biological Oxygen Demand

CETESB São Paulo State Environment Agency (*Companhia de Tecnologia de Saneamento Ambiental*)

COD Chemical Oxygen Demand

COPPE/UFRJ Alberto Luiz Coimbra Institute – Graduate School and Research in Engineering /Federal University of Rio de Janeiro (*Instituto Alberto Luiz Coimbra de Pós-Graduação e Pesquisa de Engenharia/ Universidade Federal do Rio de Janeiro*)

CORHI São Paulo Coordinating Committee for the State Water Resources Plan (*Comitê Coordenador do Plano Estadual de Recursos Hídricos*)

CPMF Brazilian national tax on financial transactions (*Contribuição Provisória sobre Movimentação ou Transmissão de Valores e de Créditos e Direitos de Natureza Financeira*)

CRH São Paulo State Water Resources Council (*Conselho Estadual de Recursos Hídricos*)

DAEE State Water Resources Management Agency of São Paulo (*Departamento de Águas e Energia Elétrica*)

EMAESão Paulo Metropolitan Water and Energy Company (*Empresa Metropolitana de Água e Energia S.A.*)

EMPLASA São Paulo State Agency for Metropolitan Development and Planning (*Empresa Paulista de Desenvolvimento Metropolitano*)

FEHIDROSão Paulo State Water Resources Fund (*Fundo Estadual de Recursos Hídricos*)

FAESP São Paulo State Agricultors Federation (*Federação dos Agricultores do Estado de São Paulo*)

FIESP São Paulo State Industries Federation (*Federação das Indústrias do Estado de São Paulo*)

FUSP University of São Paulo Foundation (*Fundação Universidade de São Paulo*)

IBGE Brazilian National Statistical Agency (*Instituto Brasileiro de Geografia e Estatística*)

RMSP Metropolitan Region of São Paulo (*Região Metropolitana de São Paulo*).

SABESP State Water and Sanitation Company of São Paulo (*Companhia de Água e Esgoto do estado de São Paulo*)

SERH São Paulo State Energy, Water Resources and Sanitation Secretariat (*Secretaria Estadual de Energia, Recursos Hídricos e Saneamento*)

SISEMA São Paulo State Environment Management System (*Sistema Estadual de Meio Ambiente*).

SMA São Paulo State Environment Secretariat (*Secretaria de Meio ambiente do Estado de São Paulo*)

UGP Project Management Unit (*Unidade de Gerenciamento de Projeto*)

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## **Appendix: Variables in the Analytical Framework**

As noted in Section 2, the analytical framework used for this research project entails several variables hypothesized to be related to the success or failure of river basin management institutions, grouped into four categories.

### ***Contextual factors and initial conditions***

The literature on decentralized water resource management indicates that successful decentralization is at least partly a function of the initial conditions that prevail at the time a decentralization initiative is attempted. These initial conditions are elements of the social context of the decentralization effort. They include

- Economic development of the nation;
- Economic development of the basin area;
- Initial distribution of resources among basin stakeholders; and
- Class, religious, or other social/cultural distinctions among basin stakeholders.

### ***Characteristics of the decentralization process***

In countries that have attempted to decentralize water resource management to the basin level, characteristics of the decentralization process itself will affect the prospects for successful implementation. Two necessary conditions of a decentralization initiative are (a) devolution of authority and responsibility from the center, and (b) acceptance of that authority and responsibility by the local or regional units. Whether (a) and (b) occur will depend in part upon why and how the decentralization takes place. Important factors include

- Whether basin-level management was a local initiative to assume management responsibilities, a devolution that was mutually desired by local stakeholders and central government officials, or a decision by central government officials to shed water resource management responsibilities regardless of whether basin stakeholders wanted to assume them;
- The extent of central-government recognition of local-level basin governance; and,
- Whether central government officials maintained a policy commitment to decentralization and basin management through transitions in central government administration.\

### ***Characteristics of central government/basin-level relationships and capacities***

Because successful decentralization requires complementary actions at the central government and local levels, other aspects of the central-local relationship can be expected to condition that success. Political and institutional variables should be explored that relate to the respective capacities of the central government and the basin-level stakeholders, and the relationship between them. Key factors include

- The extent to which devolution of water management responsibilities from central government to basin institutions has been real or merely rhetorical, and whether devolution has been handled as a supportive transition to basin management or as an abrupt abandonment of central government authority;
- The financial resources available to basin-level institutions, and the extent of their financial autonomy;
- Basin management participants' ability to create and modify institutional arrangements that are tailored to their needs and circumstances;
- The extent of other experience at the local or regional level within the country with self-governance and service provision;
- The distribution (particularly asymmetries) of national-level political influence among basin stakeholders;
- Characteristics of the water rights system in the country which facilitate or hinder basin management efforts; and
- Whether basin-level institutions have had adequate time for implementation and adaptation of basin management activities.

### ***The internal configuration of basin-level institutional arrangements***

Successful implementation of decentralized water resource management will also depend on features of the basin-level arrangements created by stakeholders and/or central government officials. Important ones include

- The presence of basin-level governance institutions;
- The extent of clarity of institutional boundaries, and their match with basin boundaries;
- Whether and to what extent basin-level institutional arrangements recognize sub-watershed communities of interest;
- The availability of forums for information sharing and communication among basin stakeholders;
- The ability to make, monitor, and enforce contingent contracts whereby basin stakeholders can agree to contribute to improvements in basin conditions;
- The institutionalization of regular monitoring of basin conditions by means that are trusted by water users; and

- The availability of forums for conflict resolution.

Certainly, these factors will not all apply with equal significance in all cases. In each case, the emergence and path of river basin management will be affected profoundly by some of these variables, affected slightly by others, and not at all by some. Institutional analysis in a case-study setting consists largely in determining which institutional factors in what combination appear to have been linked to outcomes. Furthermore, many of the variables listed above have subjective components, and will be assessed differently by different participants and observers. It is therefore essential in these case studies that team members interview individuals with a variety of perspectives.